ELECTRICAL TIMES

THURSDAY
27 NOV.
1952
NINEPENCE

The design of HENLEY Cablegrip type Boxes is based on years of experience of practical jointing conditions, and incorporates many features which facilitate jointing operations.

The range includes Straight Through, Service and Branch Boxes for underground installation, each of them incorporating the Cablegrip gland and armour clamp.

HENLEY

CABLEGRIP

STRAIGHT THROUGH SERVICE AND BRANCH BOXES

Ask for Catalogue 26

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53 HATTON GARDEN, LONDON, E.C.1

PAXOLIN TUBES FOR ELECTRICAL INSTALLATIONS

We have a considerable amount of modern plant designed specially for the manufacture of Paxolin laminated paper tubes in several grades to meet many applications both electrical and mechanical.

THE MICANITE & INSULATORS COMPANY LIMITED

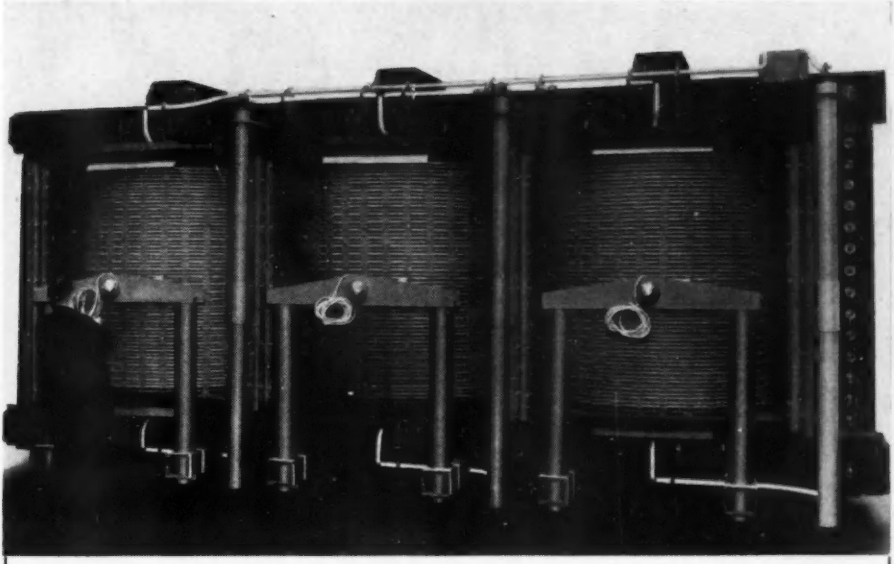
Empire Works • Blackhorse Lane • Walthamstow • London • E.17

BRANCH OFFICES at BIRMINGHAM · CARDIFF GLASGOW · MANCHESTER and NEWCASTLE-UPON-TYNE and representatives in most countries throughout the world.

m and i

Manufacturers of MICANITE (Built-up Mica Insulation). Fabricated and Processed MICA. PAXOLIN Laminated Materials. PANILAX Laminated Materials and Mouldings. EMPIRE Varnished Insulating Cloths and Tapes. HIGH VOLTAGE BUSHINGS AND TERMINALS. Distributors of Micoflex-Duratube Sleevings, Micoflex-Duraseeve (Plastics-covered flexible metal conduit) and Kenutuf Injection Mouldings (P.V.C.)

Britain's first 275 kV Transformer



One of several
120 MVA, 275/132 kV Auto Transformers for the British Electricity Authority.

'ENGLISH ELECTRIC'
transformers

THE ENGLISH ELECTRIC COMPANY LTD, QUEENS HOUSE, KINGSWAY, LONDON, W.C.2
Transformer Department, Stafford

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON
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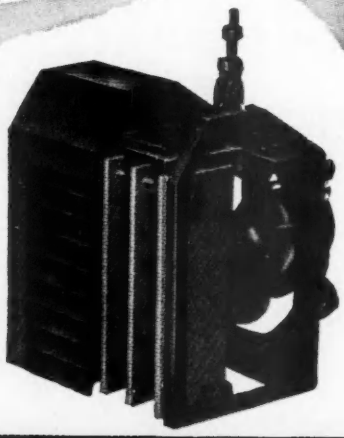
A

UNIT HEATERS

Made in 3 sizes 3, 5 and 10 Kw.

- ALL ELECTRIC
- SIMPLE TO INSTAL
- ECONOMICAL TO RUN
- AUTOMATIC CONTROL
- REFRESHING ATMOSPHERE IN SUMMER
- AUGMENTS EXISTING HEATING SYSTEMS
- MINIMUM OF MAINTENANCE



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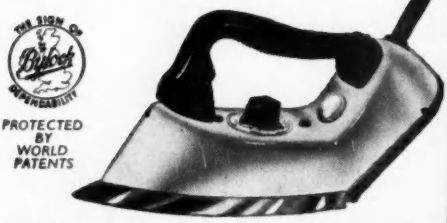
CARTER & COMPANY (NELSON) LTD.

NELSON LANCASHIRE

TELEPHONE · 638

HOT NEWS now released!



PROTECTED BY WORLD PATENTS

Safety in ironing—no more scorch marks—no risk of fire. The moment the hand is removed the hot soleplate lifts from the work—no effort on the operator's part. Fatigue is lessoned—ironing time reduced. Thermostatic control covering Rayon to Linen from 240° F to 450° F. Sized for flat work—shaped for frills—relieved for button clearance.
Exclusive non-tarnishable alloy low consumption soleplate. Send for Literature. **£3.2.6**

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Owing to overseas demands place orders promptly.

THE **BYLOCK**

VICTOR *Safety* IRON

BYLOCK ELECTRIC Ltd., ENFIELD, MIDDX.

SHUNT FIELD RHEOSTATS

For Motors, Generators and Alternators. Also as series Rheostats for voltage, heat and speed control. We shall be pleased to send full particulars and prices on request. And remember, the advice of Cressall Technicians is always available.

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Registered Trade Name of

THE CRESSALL MANUFACTURING CO. LTD.
Tower Street, Birmingham 19
Telephone: ASTon Cross 2666 (3 lines)
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You cannot buy better gear

CROWN

CROWN SWITCHFUSES AND SWITCH SPLITTERS

DESIGNED FOR SP/N CIRCUITS.
SLOW BREAK A.C. SWITCH.
OPERATED FROM THE FRONT.
ALL-INSULATED AND METAL CLAD.
FOR 15 & 30 AMPERES 250 VOLTS.
DETAILS ON REQUEST.

BILL SWITCHGEAR LTD.
ASTON LANE · PERRY BARR
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LONDON S.W.1	MIDLANDS	NORTH MIDLANDS	CHELTENHAM	MANCHESTER 3	BRISTOL 1	YORKSHIRE	GLASGOW
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It's no trouble...

..... **to sell** – *it has so many exclusive features.*

.... **to buy** – *it's just the right price for you and your customer – £34. 12. 6*

..... **to use** – *the glass door, thermostat etc., make cooking so much easier.*

... **to stock** – *never stays long in stock as we're advertising it so extensively.*

... **to clean** – *oven is removeable in one piece – vitreous enamel throughout.*

. **to maintain** – *never goes wrong!! and it conforms to E.D.A Spec. throughout.*

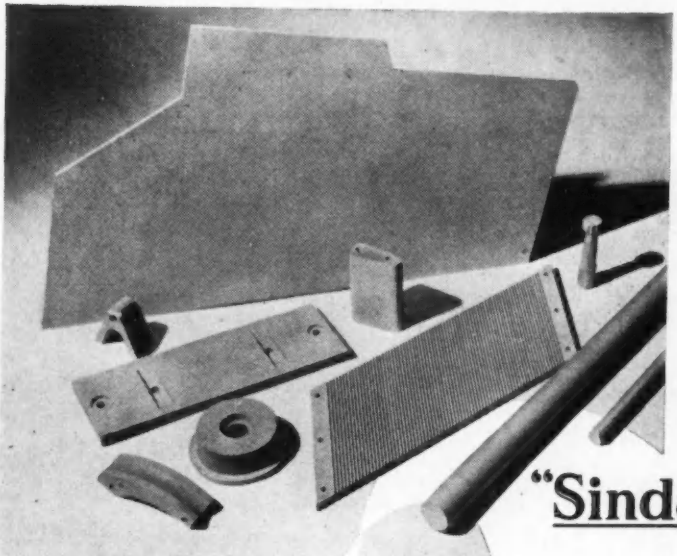
.... **to ring HOWARD 1212**

– or to send an order to Bridge Works, Enfield before your stock gets too low.

The Belling 47AB Cooker

"Belling" **glass door cookers**

CRC.395



"SindanyO"

Asbestos Electric

ARC & HEAT RESISTING BOARDS

NATURAL GRADE

A general-purpose insulating material classed as a Non-Ignitable Board under British Standard Specification 737. Supplied in the form of standard sheets 4 ft × 3 ft in thicknesses from ¼ in. to 3 in. It is similar to the Ebony Grade in its machining properties. Natural Grade "Sindanyo" is suitable for continuous working temperatures up to 350 deg. C., but is frequently employed under more severe conditions of temperature under compression loading or where it may be unstressed mechanically. Natural Grade "Sindanyo" may also be treated so as to resist moisture absorption and to improve its electrical characteristics. Colour: Grey.

"Sindanyo" Ebony Grade is available for electrical insulating purposes.

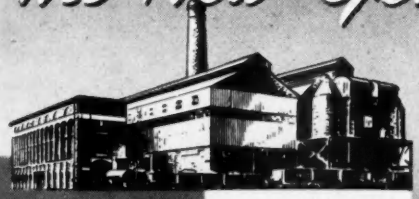
TURNERS ASBESTOS CEMENT CO LTD

A MEMBER OF THE TURNER & NEWALL ORGANISATION

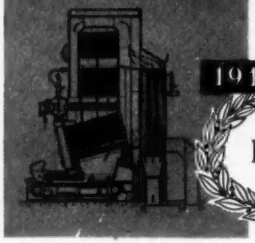
TRAFFORD PARK MANCHESTER 17

S.7.

The New Generation at NORTH TEES



North Tees "A" Power Station



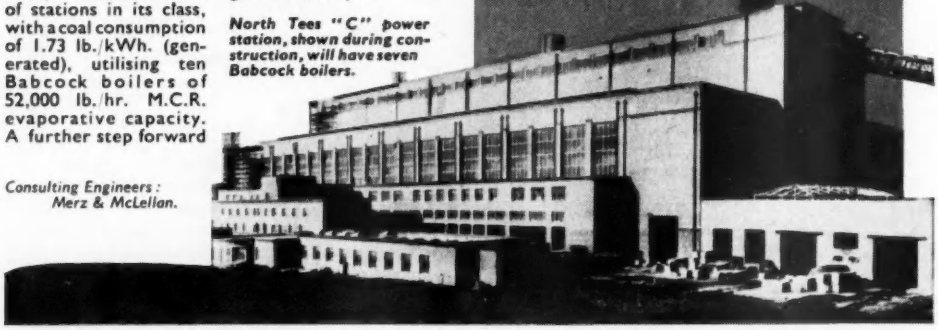
1917 BABCOCK 1952

The original North Tees power station, commenced in 1917, was the first in Great Britain with high pressure boilers and represented the latest in power station practice.

With steam at 475 lb./sq. in. and 700°F, the introduction of reheat, and three stage bled steam feed heating, it marked a very big advance in the quest towards higher thermal efficiencies for base load stations. As early as 1923, it headed the list of stations in its class, with a coal consumption of 1.73 lb./kWh. (generated), utilising ten Babcock boilers of 52,000 lb./hr. M.C.R. evaporative capacity. A further step forward was made in 1925 when the "B" station opened, with eight Babcock boilers of 94,000 lb./hr., which were followed by two more of 180,000 lb./hr. in 1942.

Now, a new station is arising at North Tees. Its capacity will be 240 MW against the original 40 MW. Its steam conditions are 950 lb./sq. in. and 940°F. But the boilers, now each of 360,000 lb./hr. capacity, will still be BABCOCK — a new generation of a distinguished family.

North Tees "C" power station, shown during construction, will have seven Babcock boilers.



Consulting Engineers: Merz & McLellan.

BABCOCK & WILCOX LTD., 35 FARRINGDON STREET, LONDON, E.C.4

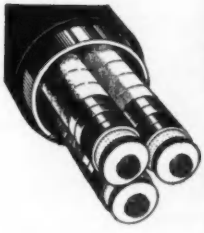
BRAEHEAD UNDER LOAD

Enfield 132 kV Compression Cables for the B.E.A. South-West Scotland Division (Braehead-Govan-Haggs Road)

The first part of the Braehead Power Station 132 kV installation is now under load.

It comprises 5,500 yards of Enfield 0.5 sq. in. 3-core pipe line compression cables. These paper-insulated and lead-covered cables were pulled into a steel pipe which contains a nitrogen gas pressure of 200 lb. per sq. in. The second part of the contract, from Govan to Haggs Road, is now nearing completion.

The Braehead contract is one of the largest 132 kV installations carried out in this country; it is the most recent to be put on load among a growing number of similar types of cable in Europe and America. Laying and jointing were carried out without incident along busy main streets and arterial roads.



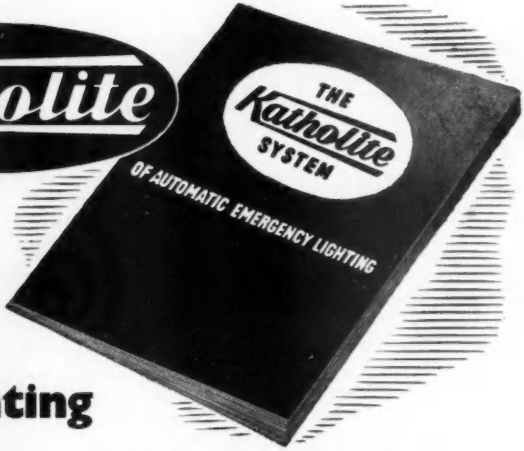
ENFIELD

132 kV COMPRESSION CABLE

ENFIELD CABLES LIMITED · BRIMSDOWN, MIDDLESEX

HOWard 2661 (Works) **London Office: HOLborn 9292**

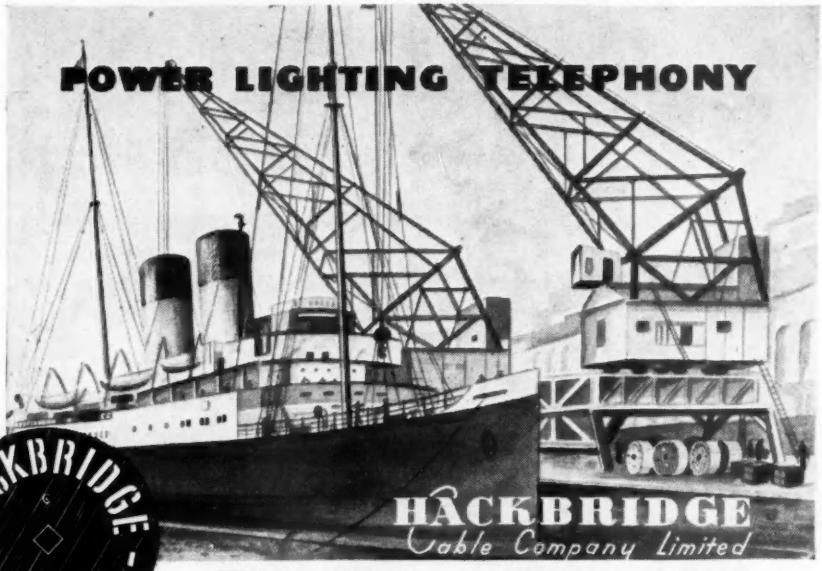
The Katholite System of Automatic Emergency lighting



Our wide experience in connection with the installing and operating of Emergency Lighting Systems is freely at your service. We invite you to write for a copy of publication No. D.P. 814 containing much useful information, with circuit diagrams.

THE D.P. BATTERY CO LTD
BAKEWELL DERBYSHIRE
LONDON 66 VICTORIA STREET S.W.1

J.249



HACKBRIDGE CABLES

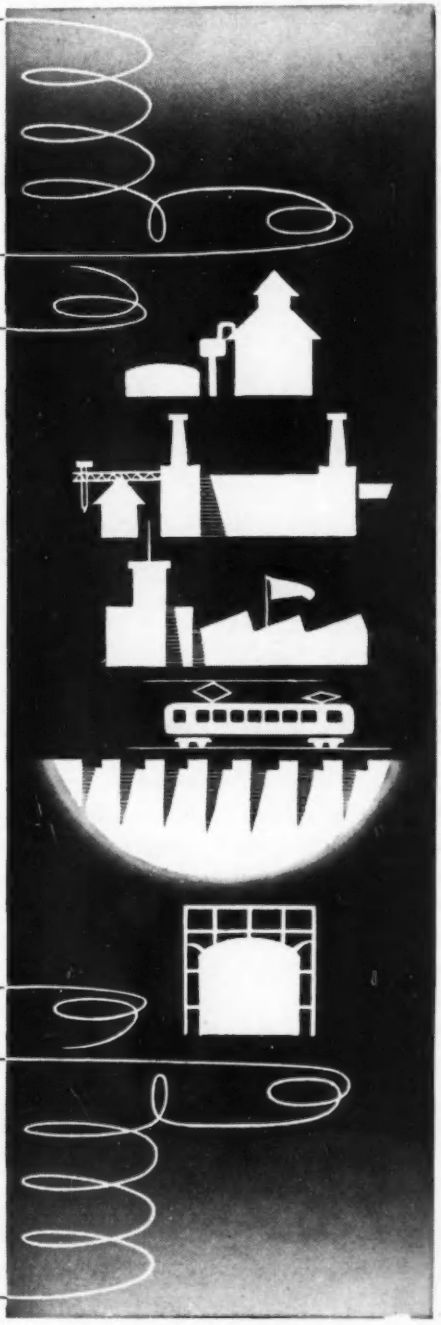
KELVIN WORKS, HACKBRIDGE, SURREY
In Association with BRYCE ELECTRIC CONSTRUCTION CO., LTD.
Branches at BIRMINGHAM, BRISTOL, CARDIFF, MANCHESTER, NEWCASTLE, SHEFFIELD.

Large supervisory staffs superseded!

two wires now give complete control

"A.T.M." Supervisory Remote Indication and Control Equipment soon pays for itself in the manpower it saves. Facilities include: operation of circuit breakers, starting and stopping of machines, raising and lowering of voltages by transformer tap-change equipment, essential metering and indication of fault conditions, etc.

The equipment has also been successfully adapted for remote-control in gas distribution networks, oil refineries, electric railways, aerodromes and blast furnaces.



ATM

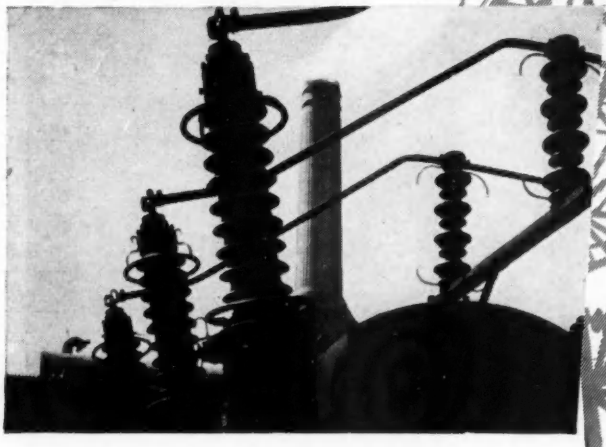
Supervisory Remote Indication and Control Equipment

Automatic Telephone & Electric Co. Ltd., Strowger House, Arundel Street, London, W.C.2. *Telephone: TEMple Bar* 4506. Telegrams: Strowger, Estrand, London. Strowger Works, Liverpool 7.

AT.4481-CX23

B

P & G BATTERIES in the public service



P & G Batteries play an important part in maintaining the efficiency of Britain's giant grid system. In countless substations where the flow of energy is broken down to comply with local needs, there you will find P & G Batteries operating vital switchgear or providing emergency lighting should the mains supply fail. The P & G service extends into many spheres, a natural result of 60 years' experience of battery manufacture and development. In round terms here it is. **1.** *Technical Advice and Specifications.* **2.** *Complete equipment and installation.* **3.** *Regular inspection and report.* A discussion of your scheme may help. We are always ready to agree that two heads are better than one.

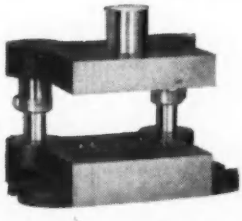
PRITCHETT & GOLD and EPS Co. LTD
50 GROSVENOR GARDENS · LONDON · SW1

2 *heads are better than* **1**

PG18

Batteries for Switch Closing, Switch Tripping, Emergency Lighting, Supervisory Control, Telephones, Supply to Auxiliaries

We can make your press tool sets—often better, and always quicker and cheaper than you can make them yourselves.



Desoutter

PRESS TOOL SETS SAVE YOUR SKILLED LABOUR

Desoutter Bros. Ltd., The Hyde, Hendon, London, N.W.9. Telephone: Colindale 6346 (five lines). 'Grams: Despnuco, Hyde, London

CRC85

Your Electrician likes it, too

The wiring of the Wylex Fuse Unit is easy because the connections are easy to get at and there is plenty of room. There is no "blind" wiring.

You will appreciate too, the high quality that makes sure you install a trouble-free job.

4 Way

6 Way

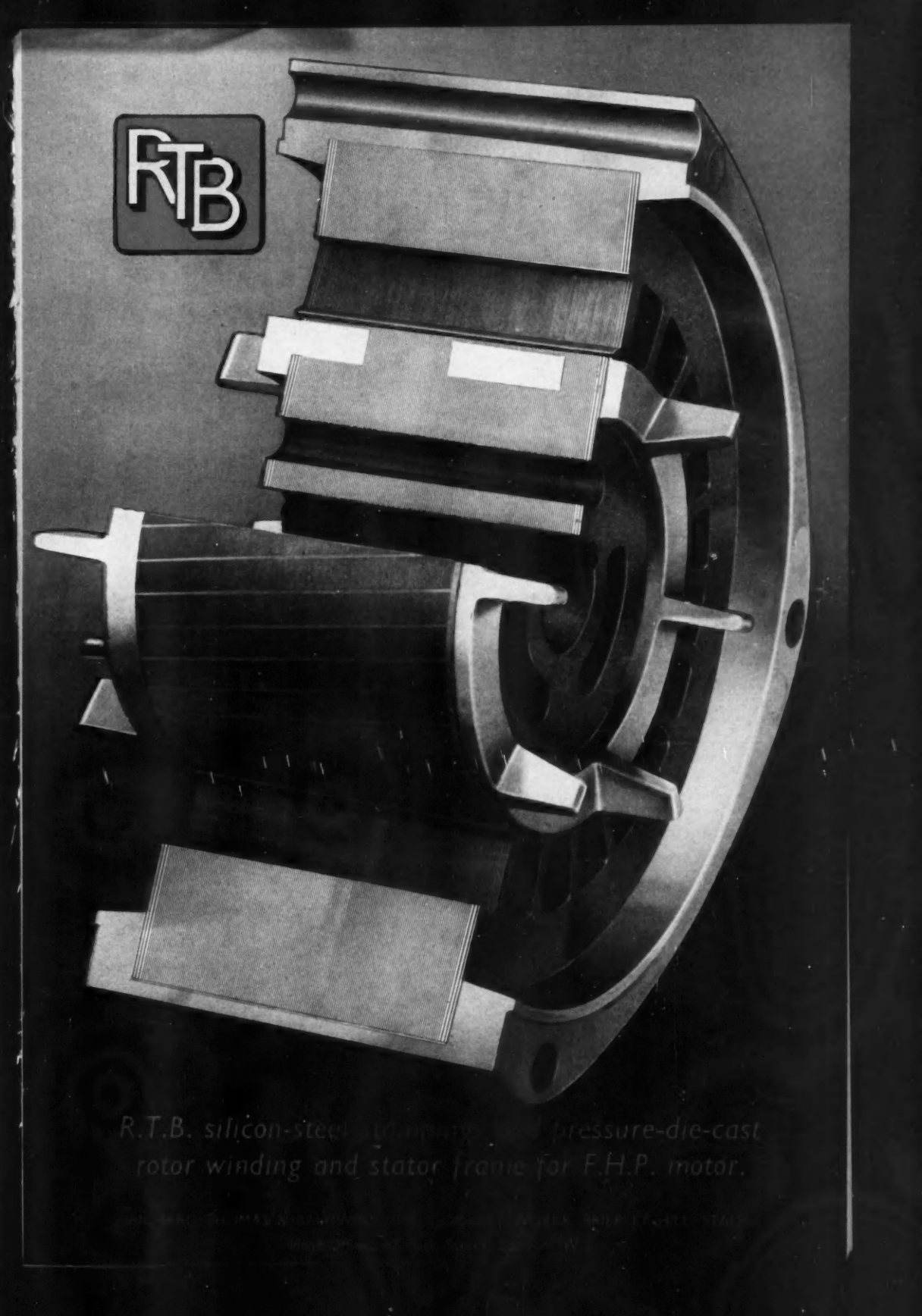
8 Way

Wylex

SWITCH FUSE CONTROL UNIT

Write for New Catalogue:–

GEORGE H. SCHOLES & CO. LTD., Wylex Works, Wythenshawe, Manchester.



R.T.B. silicon-steel laminations, pressure-die-cast rotor winding and stator frame for F.H.P. motor.

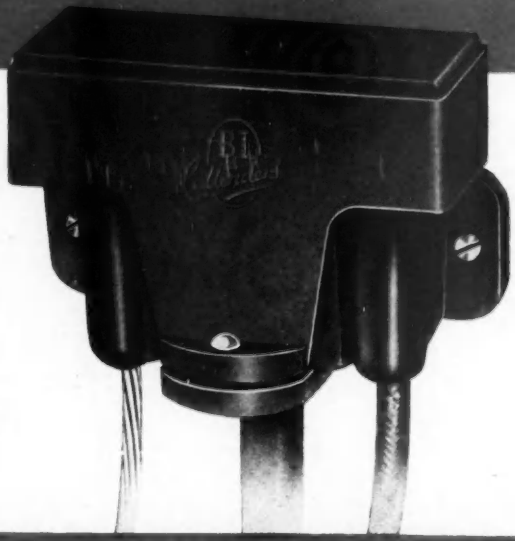
A Weatherproof All-Insulated
SERVICE BOX

Designed for rural installations, the BICC Overhead Service Connection Box offers a convenient method of connecting leads from overhead lines to rubber-insulated H.S.O.S. cables.

Moulded in high-grade insulating material, it is strong, weather resisting and non-hygroscopic. The design is simple, providing easy access to the terminals, resulting in speedy installation.

B.I. Callender's

Overhead Service Connection Box



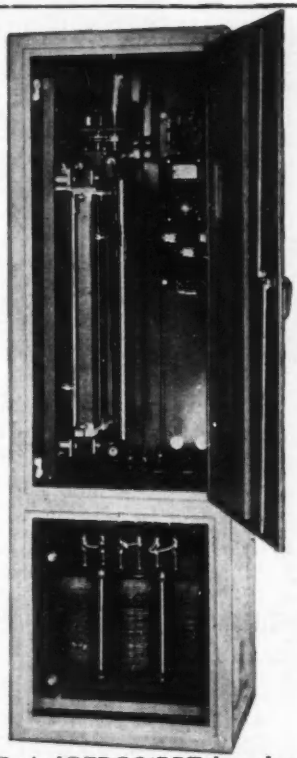
These units are suitable for use with BICC House Service Overhead System Cables, and should be sealed with BICC Weatherproof Plastic Compound.

Suitable for two single-core incoming leads and one twin-core outgoing cable in sizes up to 19/.064".

BRITISH INSULATED CALLENDER'S CABLES LIMITED
NORFOLK HOUSE, NORFOLK STREET, LONDON, W.C.2

Is VF* *spoiling your output?*

Whenever the successful operation of apparatus or plant depends on an absolutely constant mains voltage, then "V.F."* (Voltage Fluctuation) can have disastrous effects. Every variation results in loss of efficiency, and output suffers accordingly. That is why BERCO and B.P.T. voltage and current regulating equipment plays an important part in well planned organisations all over the world.



Typical BERCO/BPT three phase Automatic Stabiliser 30 kVA.

BERCO hand-operated single-phase Regavolt.

For constant voltage use a model from the wide range of Automatic Stabilizers made by British Power Transformer Co. Ltd., for single and three phase supplies.
For variable voltage select a "Regavolt" from the wide range of models made by The British Electric Resistance Co. Ltd. Interesting information and full performance details given in booklet No. C 5011.

THE BRITISH ELECTRIC RESISTANCE CO. LTD.
BRITISH POWER TRANSFORMER CO. LTD.
Queensway · Ponders End · Middlesex
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MARTINDALE

A portable air blast

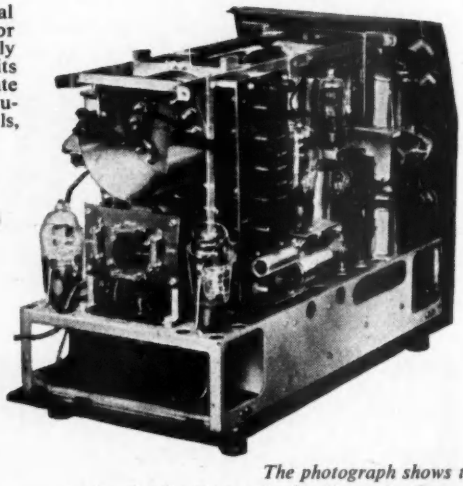
The long, thin, insulated nozzle makes it possible to blow out dust from the most awkward corners of electric switchgear, motors, electronic equipment and other plant, even when "alive." A selection of five machines of various sizes is available to cover all kinds of work where either a blower or a portable vacuum cleaner is required.

Martindale Portable Blowers are of first class construction and guaranteed for a year against faulty workmanship. Supplies from stock.

MARTINDALE ELECTRIC CO. LTD., 45 WESTMORLAND ROAD, LONDON, N.W.9

Inside Information on Oscillographs

Symonds' copper wire is found in many unusual places . . . helping to measure wave-lengths, for instance. In an Oscillograph the wire is doubly invisible both because of its position and its insulation, yet it is vitally important to the delicate mechanism of the whole. That is why Radio Manufacturers in their search for high quality materials, so often specify Symonds wire for their sets.

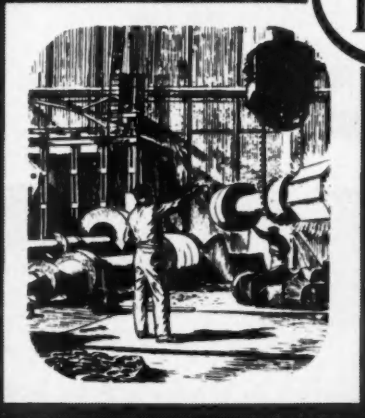


The photograph shows the chassis of a Cossor Double Beam Oscillograph

R. H. SYMONDS Ltd., 47 Victoria St., London, S.W.1. *Works: Enfield, Middlesex*

Men at work rely on

B
T-H



With BTH electrical equipment the emphasis is on reliability in service. Whether it is control gear for a train, a large motor to drive a mine-winder, special electrical equipment for load handling, or a 'built-in' motor in the machine shop, no effort is spared to ensure ability to stand up against the most rigorous working conditions likely to be met. The Company also makes in its many factories steam turbines, hydro-electric plant, generators of all kinds, light and heavy switchgear, electronic devices, marine and aircraft equipment, Mazda lamps and lighting equipment.

THE
BRITISH THOMSON-HOUSTON
COMPANY LIMITED, RUGBY, ENGLAND
Member of the AEI group of companies

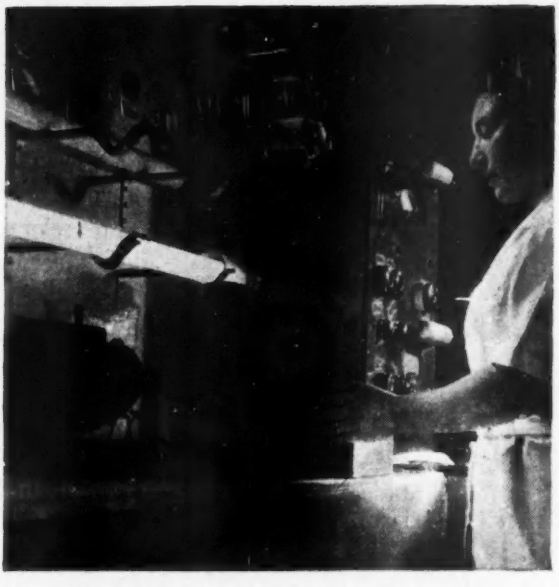
A4519

NO FLUORESCENT TUBES

Last Longer
Give more Light
Are more Reliable

THAN

Osram



The outstanding reliability of Osram tubes springs from half a century of lamp-making experience. The same quality-control techniques–developed over the years for tungsten filament lamps—are used for controlling the production of fluorescent tubes at all stages, from the basic raw materials to the finished product. Always specify Osram—the wonderful light.

A G.E.C. PRODUCT

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY LONDON, W.C.2

2
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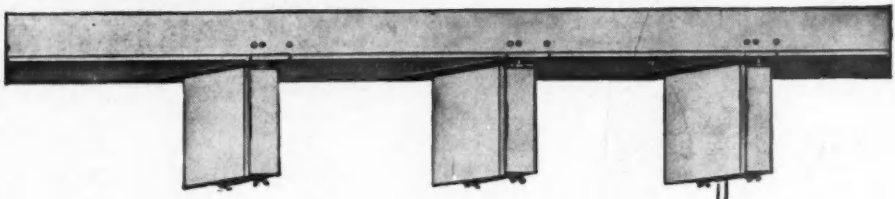
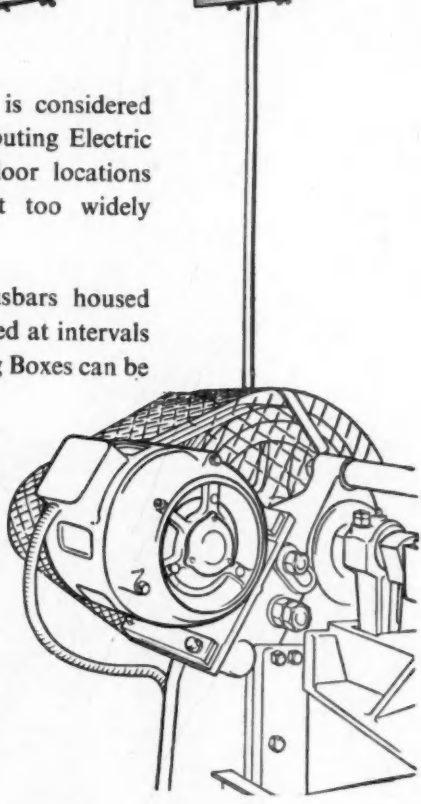
The wide range of Transmission Line Equipment manufactured by Bayliss, Jones and Bayliss includes the following items
1 Line Strap
2 Cross Arm
3 Tie Strap
4 Drive-in Step
5 D' Iron & Pin
6 Transformer Bracket
7 Pole Step Plate
8 Detachable Pole Step
9 Stay Rod
BAYLISS, JONES & BAYLISS LIMITED

OVERHEAD BUSBARS



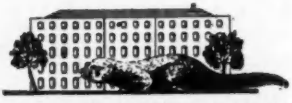
BUSBAR TRUNKING is considered by many to be the best method of distributing Electric Power in Machine Shops and other indoor locations where power is required at points not too widely separated.

The system consists of bare copper Busbars housed in a steel duct. Tapping points are provided at intervals of two feet along the duct. Fused Tapping Boxes can be plugged into these as required, and the load connected by short runs of cable in conduit.



BUSBAR TRUNKING is made in standard 12-ft. lengths. These can be erected in a variety of ways to suit individual requirements.

This ideal system is reasonable in first cost, cheap to install, and capable of alteration with all speed, with the minimum loss of production hours.



OTTER MILL SWITCHGEAR

Write for Catalogue BBT 102 A

G. M. ENGINEERING (OTTERY ST. MARY) LTD

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You get all these in a C.P. "Fractional" . . .

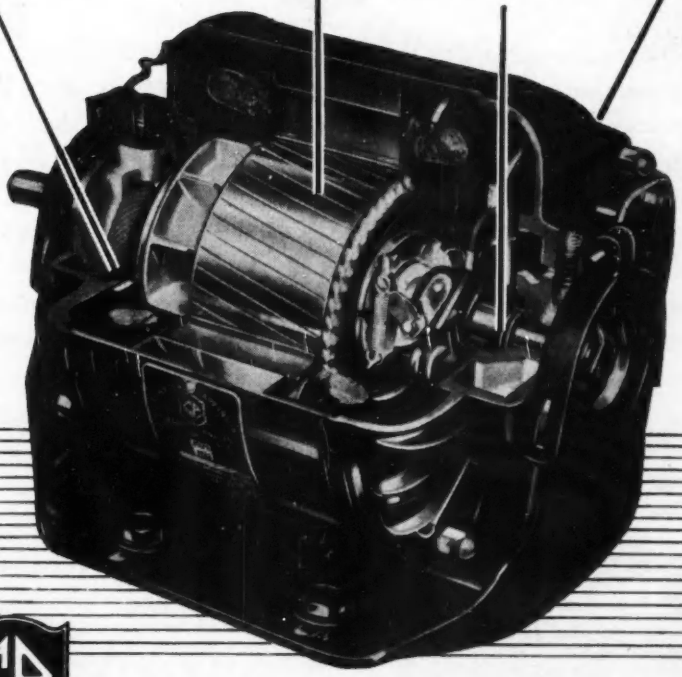
The unique 'Marathon' bearing filled with enough oil to last two years non-stop running.

Rotors dynamically balanced on highly sensitive machines.

Interchangeable frames. Standard A.C. and D.C. motors of the same rating have identical important dimensions.

Exceptionally quiet running. Every motor passes a stringent Silence Room test.

Spring-loaded thrust washers which prevent end play for the whole life of the motor.



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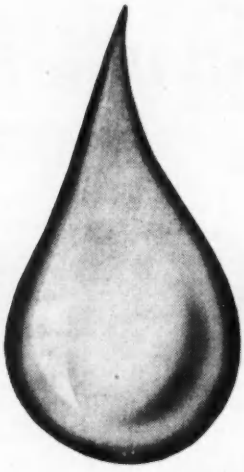
Bandit  at bay!

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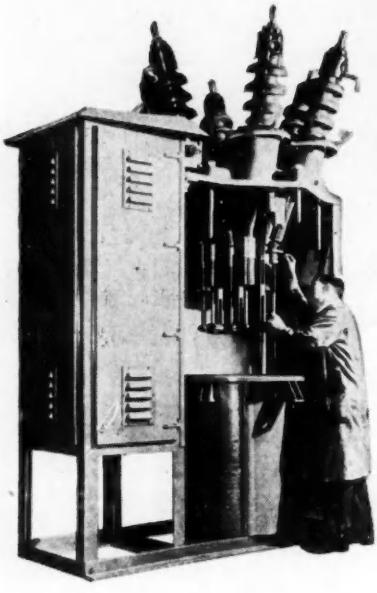

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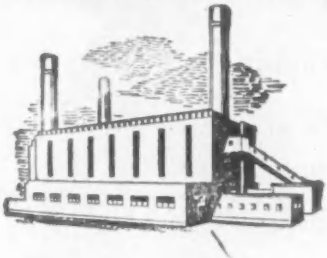

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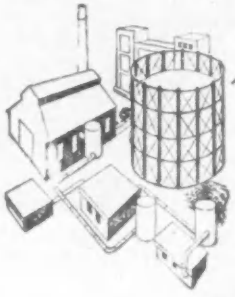

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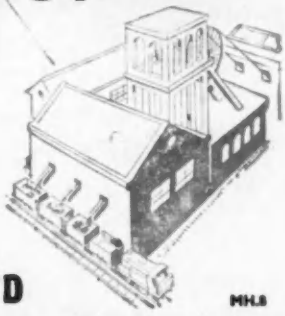

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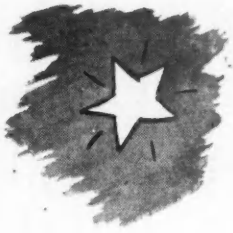
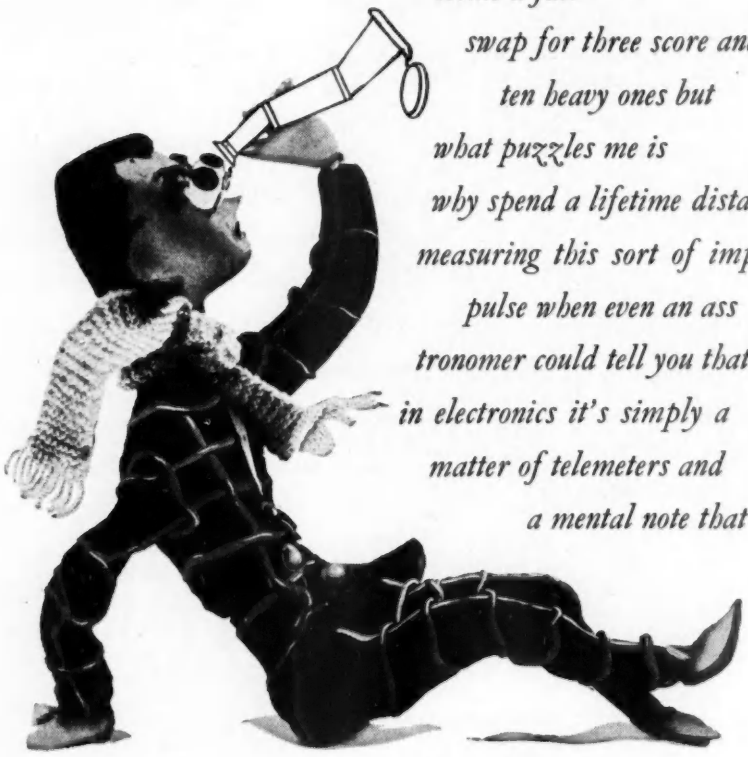


looking at it
from this angle two
thousand light years
seems a fair
swap for three score and
ten heavy ones but
what puzzles me is
why spend a lifetime distantly
measuring this sort of imp
pulse when even an ass
tronomer could tell you that
in electronics it's simply a
matter of telemeters and
a mental note that



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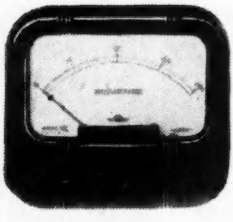

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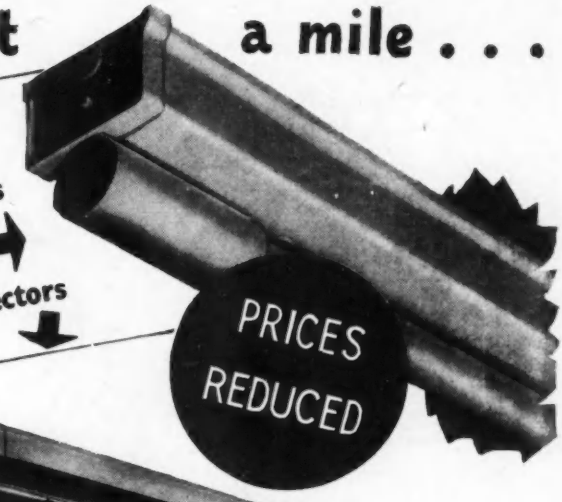

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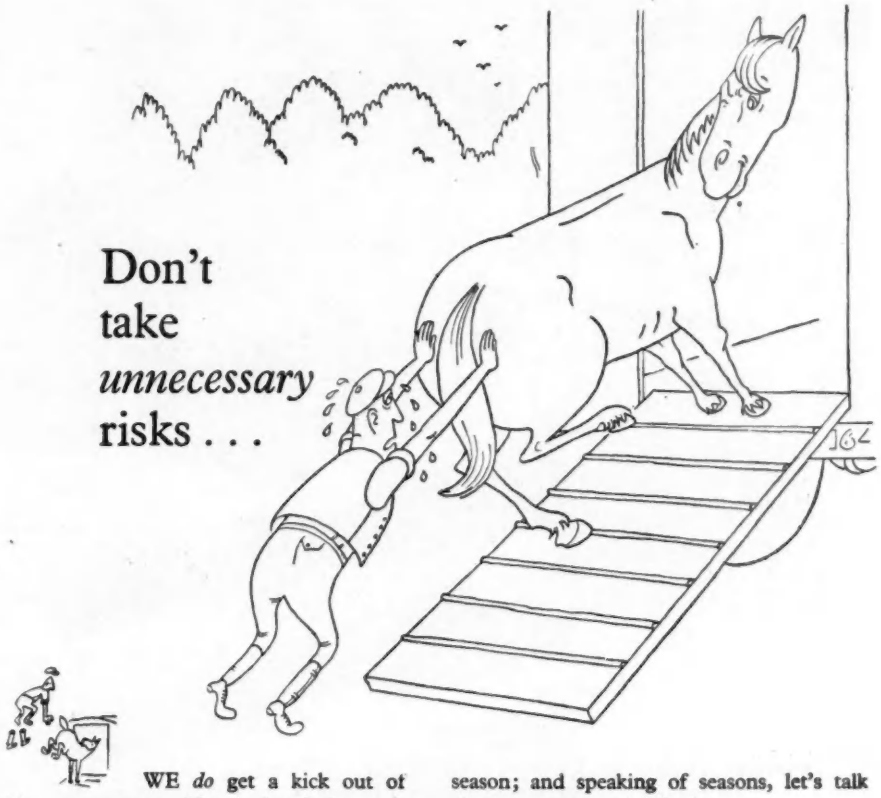

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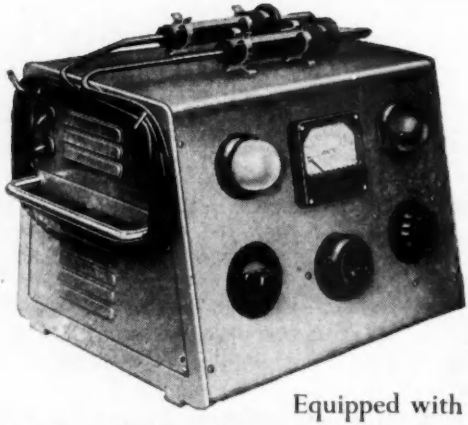

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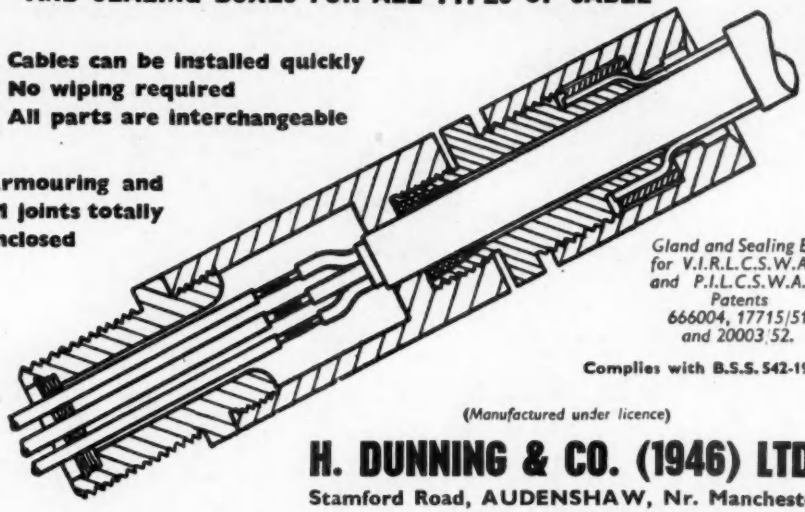

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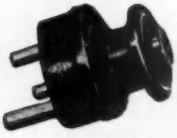

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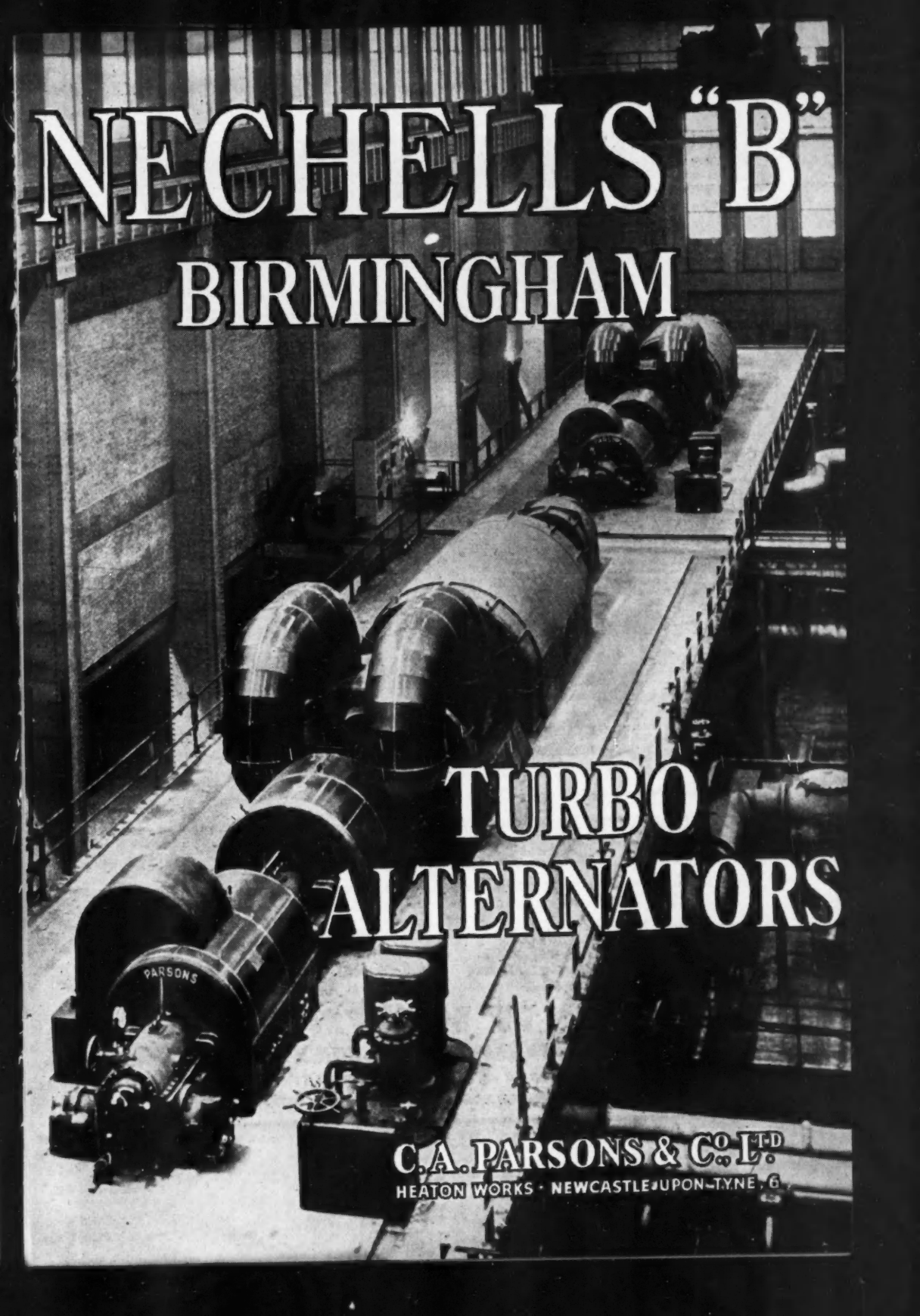
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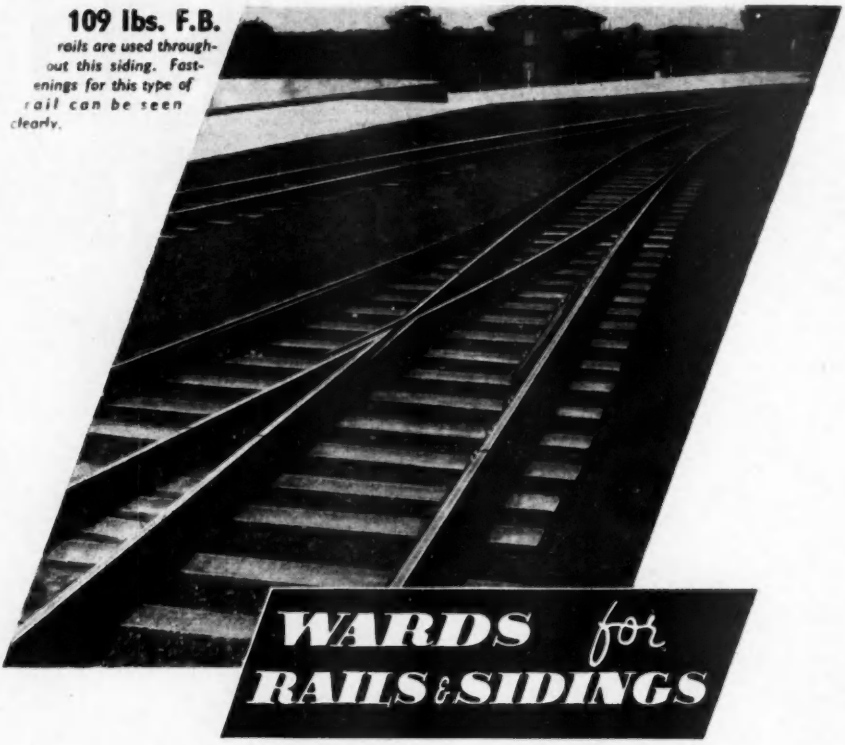
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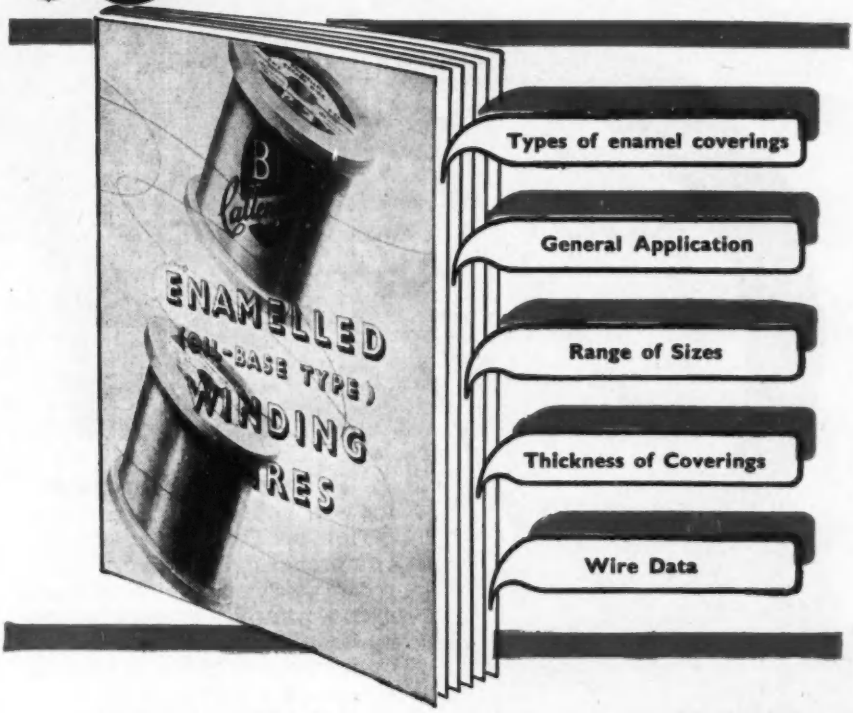

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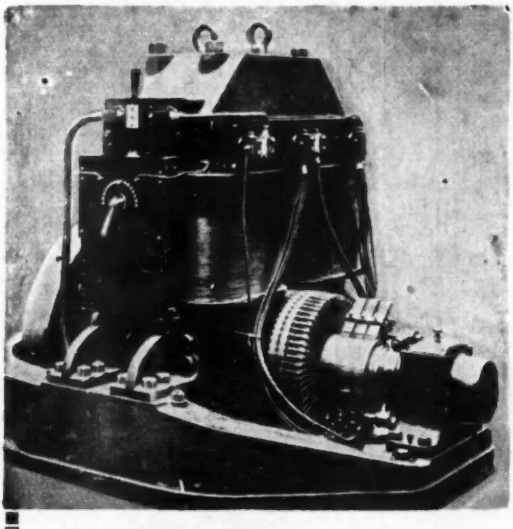

153 kW Dynamo. Photo by courtesy of Laurence, Scott and Electromotors Ltd.

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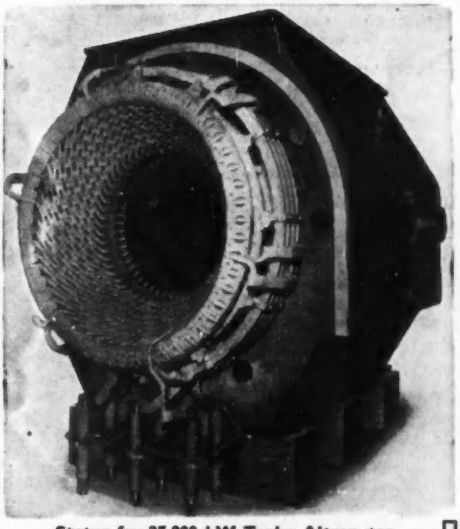

Stator for 25,000 kW Turbo Alternator
Photo by courtesy of the English Electric Co. Ltd.

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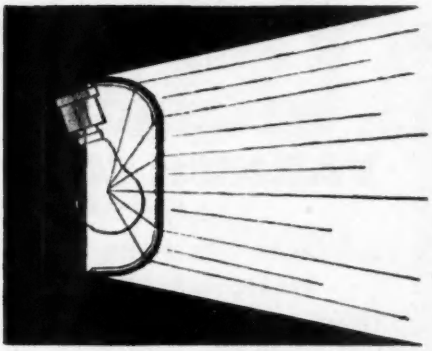

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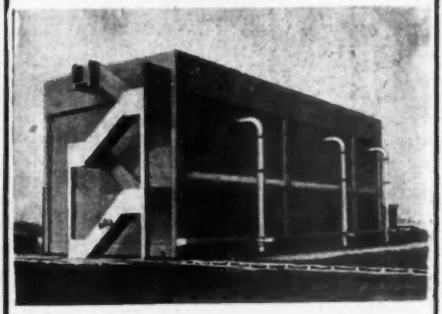

Illustration of Cellular Mechanical Induced Draught Tower.

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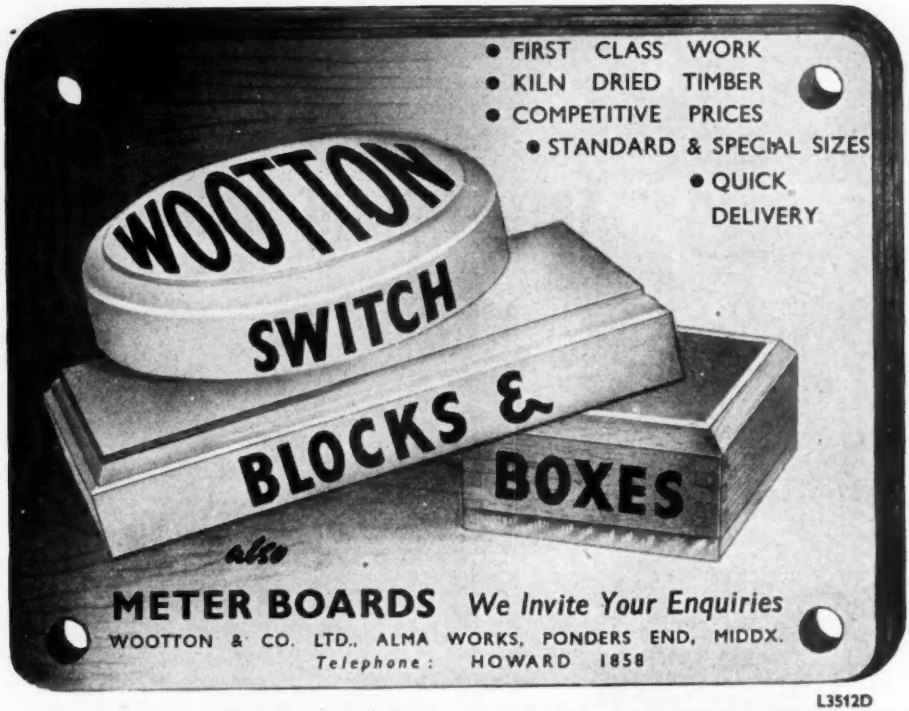

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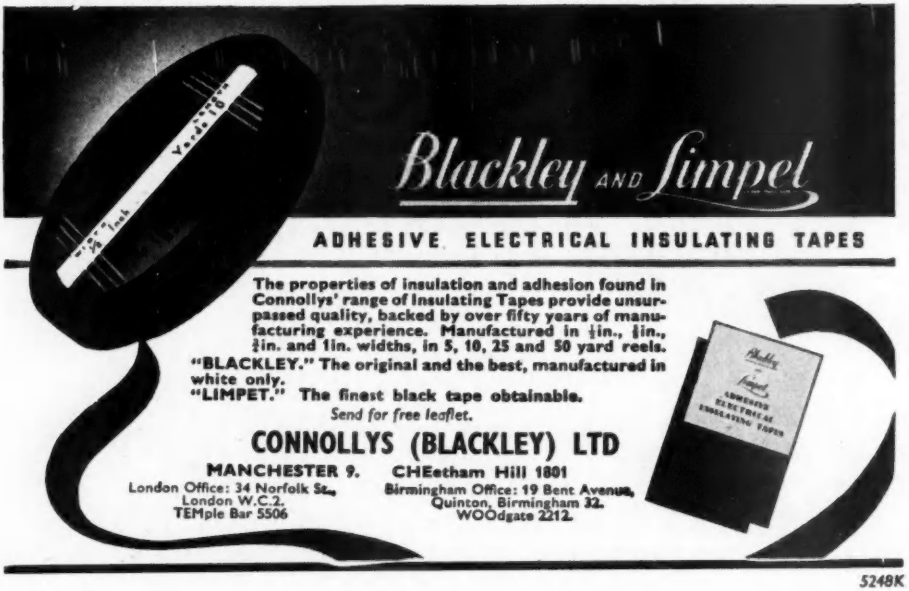
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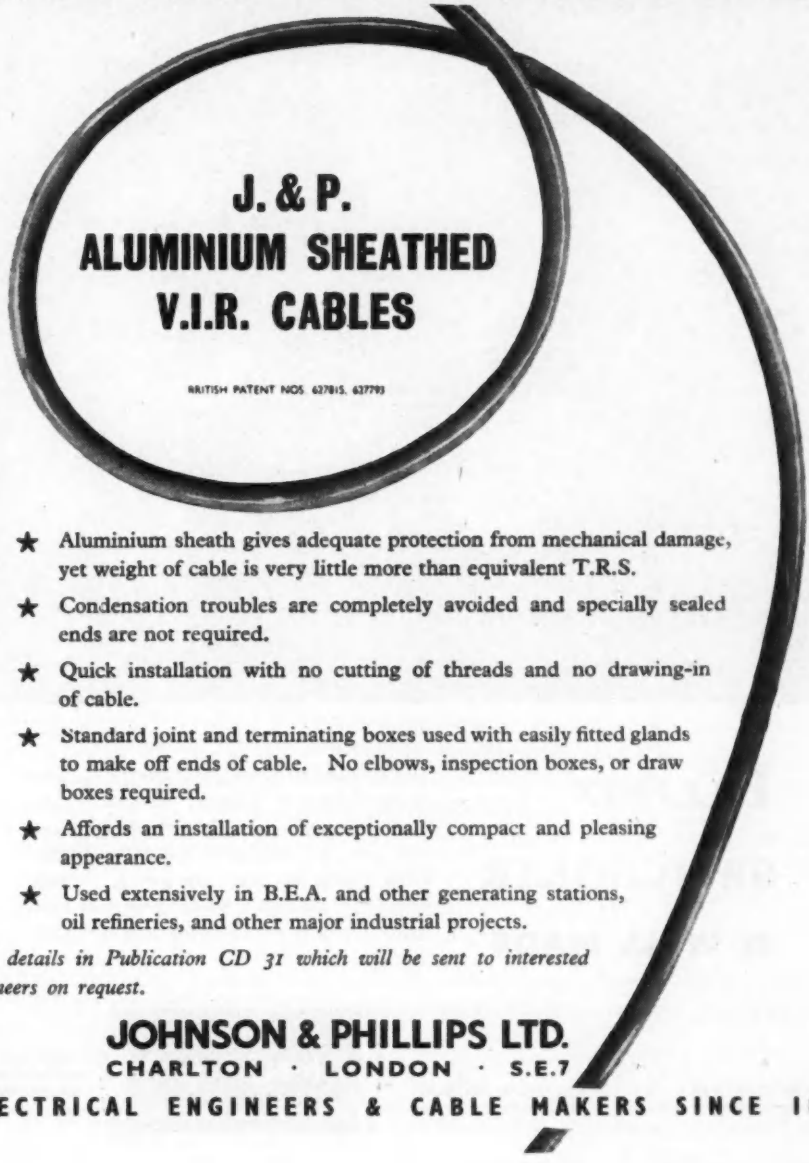

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Editorial

FOCUS ON ALUMINIUM

IS aluminium to be the conductor of the future? It would be rash to hazard a guess, for copper will always have the advantages of higher conductivity, ease of tinning and greater resistance to corrosion. However, the present trend of metal prices provides a substantial bonus on the use of aluminium to replace both copper and lead and such judgment as may be possible suggests that within the foreseeable future there will remain some appreciable financial advantage in its use. It is these conditions that have bred the present quickening interest in aluminium. First the introduction of aluminium sheaths for underground cables, and now the development of new soldering techniques, have led to renewed interest in the use of aluminium conductors. The future for such conductors will largely depend on the success of the new soldering techniques in the hands of the ordinary jointer, but by all accounts they do provide a substantial advance on former aluminium solders. Only time, however, can fully prove the adequacy of the cable and its joints to the satisfaction of the supply engineer, and by tradition the life expected of cables is long. Too long to await the final answer, when by accepting some uncertainty now, cable costs can be cut at this time when high capital costs are viewed with the gravest apprehension.

RURAL ECONOMICS

BEFORE the war, a ton of hay was worth about £5 to the farmer; today the comparable figure is £14. This great change has not been matched by any corresponding rise in the price of electricity. As a result, the use of electrical energy in the various methods of artificial drying that can improve the quality and value of crops is becoming an increasingly attractive proposition. Yet even with this growing advantage, there will be comparatively little progress in electrification unless area boards decide they want the load involved, and go out to get it. In an I.E.E. paper which reviews the situation as it is today, Messrs. Cameron Brown and Finn-Kelcey envisage that even with electrification of a modest proportion of the country's hay and grain drying, there would result a connected load of 1,300 MW, requiring every year some 750m kWh of energy, largely at off-peak hours and seasons. Such a demand would almost certainly provide a worthwhile investment. The question of tariffs is an all-important factor, and area boards will have to decide whether the load deserves the specially favourable rate that some enthusiasts are claiming for it. It was argued in the discussion on the paper that farm electrification is usually undertaken for some purpose other than crop-drying, and so benefits from the cheaper running rate of farming tariffs. But whether this will prove sufficient attraction to farmers remains open to discussion.

ACTION WANTED

IT would be difficult, as well as unprofitable, to estimate how many millions of words have been written and spoken about technical education in the last decade. The total is high indeed; yet the action that has resulted is in no way commensurate. The position as regards technical colleges provides an unfortunate example of this. In a White Paper published in September, 1951, the then Government promised to announce "very shortly" details of proposals for making improved financial assistance available for selected technical colleges and courses. A general election supervened, and June of this year had been reached before the Minister of Education stated in the House of Commons that she hoped "in a few weeks' time" to

announce these details. Five months later, this information, and the overall guidance to educational authorities that will presumably accompany it, is still not available. This continued delay is inexcusable, and swifter progress is vitally necessary for the well-being of the engineering industries of the country. It is high time that the present Government stilled the wordy debate on educational theories with action, both as regards the technical colleges, and also the related problem of the universities. Any of the possible schemes that have been considered is likely at the least to be more acceptable than further postponement.

EXTENDED RESEARCH

ANNUAL reports from two comparatively new D.S.I.R. research establishments drew attention last week to extensions in that department's activities. Mechanical engineering and the hydraulics of rivers, lakes, and the sea are respectively the subjects dealt with by these new stations, both of which are in some degree offshoots of that oldest of Government research ventures, the National Physical Laboratory. Their work now extends beyond what was possible within the limitations of Teddington, and they are taking their place with the co-operative research associations of individual industries in linking fundamental research and industrial applications. Both of the new stations have amongst their current projects items of interest to the electricity industry. The hydraulics station in particular provides a valuable design tool that should be of the greatest use when hydro-electric schemes are under consideration, especially with contracts overseas in the offing. In fact, the most important outcome of both establishments may well be reckoned the part they will play in raising the technical standard of British engineering design, with all that means in terms of ability to compete successfully in world markets.

H.P. EXPORTS

ANOTHER factor operating in the export field came into prominence last week. This concerns the credit facilities that can be made available to large overseas customers of this country. Questioners in the House of Commons, together with at least one prominent industrialist, have alleged that orders are being lost for the want of our ability to match the attractive repayment terms offered by some Continental competitors. Complicated questions of financial policy at the highest level are involved in any consideration of this matter; in particular, there is a suggestion that any Government support for extended credit would amount to a disguised export subsidy. The Government's conclusion at the present juncture seems to be that orders from abroad can be purchased too dearly, but it is apparent that the whole matter deserves careful examination by those best qualified to appreciate the relevant factors. The question of credit facilities has always been a thorny problem for British exporters in the past, but while they were able to ignore it before the war, because of their strength in the export field, they cannot afford to take that attitude today.

EASTERN SUPPLIES

ELECTRIFICATION is looked to as a powerful agent in raising living standards everywhere in the world, so it is natural that Unesco's Economic Commission for Asia and the Far East should pay close attention to its development in that region. The potential task there is emphasised by two statements made at a Conference held in Bangkok early last month. Eighty per cent of the population live in rural areas, yet for most countries the amount of rural electrification so far undertaken is characterised as "negligible." It seems improbable that even the comparatively rapid expansion envisaged by some countries in the area will amount to much in terms of generating capacity, for there are considerable problems to be overcome. Nevertheless, the plans prepared are ambitious in terms of what has been done before, and they deserve careful attention for the technical lessons that their implementation can teach on the particular difficulties of supply in Asia and beyond.

Meteor

ALUMINIUM *for Insulated Cables*

ITS TECHNICAL AND ECONOMIC ADVANTAGES FOR CONDUCTORS AND SHEATHING OF POWER CABLES WITH CONSIDERATION OF JOINTING TECHNIQUES

By C. H. E. RIDPATH, B.Sc., A.M.I.E.E., A.M.I.Mech.E.
Chief Electrical Engineer, Aluminium Wire and Cable Co., Ltd.

ALUMINIUM-cored cables, especially if combined with aluminium sheathing, have the outstanding advantages of really big weight reduction and reduced cost as compared with conventional lead-sheathed copper cable. It is, however, beyond the scope of this article to cover aluminium cables in detail, but the accent is rather on methods of jointing since it is this question which, in the past, has held up the use of these cables even though they were cheaper.

Since the aluminium conductor diameter is greater than that of copper for the same current carrying capacity, it follows that the cost of insulation must be greater, even though the same thickness be used. Nevertheless, except in special cases of very heavy insulation and small conductor size, this increase is not sufficient to counteract the reduced conductor cost. The overall reduction in total cost will thus tend to increase as the conductor size increases and the insulation thus becomes a smaller proportion of the total cost. It also follows that with an e.h.t. cable, the artificially increased conductor diameter necessary to reduce the electrical stress, can be attained more cheaply with aluminium—which must have a bigger diameter in any case.

The weight reduction is of great practical advantage when transporting and installing, and also when used for vertical feeders in mines or buildings where less costly supports are required. The lighter weight is also more convenient in the case of extra flexible trailing cables used for welding equipment, where the electrode holder often has to be held in awkward positions overhead; this weight reduction is most desirable for aircraft cables for which a British Standard Specification is shortly to be issued. Aluminium telephone cables paper insulated in the normal way have recently been made in this country, and further production is taking place in the near future. The reduced cost is obviously an advantage in *any* application.

Table 1 (based on Figs. 1 and 2)[1] gives the approximate percentage reduction in weight and cost of *aluminium sheathed aluminium cored cables*, as compared with (b) lead sheathed aluminium cored cables, (c) aluminium sheathed copper cable, and (d) lead sheathed copper cable with, for example, capacities of 100 kVA and 500 kVA.

TABLE 1.—COMPARISON OF WEIGHTS AND COSTS

Type of Cable	Weight Reduction		Cost Reduction	
	100 kVA	500 kVA	100 kVA	500 kVA
(b) Lead sheathed aluminium	40%	35%	37%	27%
(c) Aluminium sheathed copper	66%	43%	13%	32%
(d) Lead sheathed copper	71%	51%	45%(35%)	42%(42%)

The cost comparison is based on that of *materials only* as at April 1, 1951, and the figures in brackets take account of current (November, 1952) prices of the metals concerned.

It is not generally realised that insulated aluminium cables were first installed in this country over 40 years ago, and, therefore, the question not unnaturally arises why such cables, in view of their satisfactory operation, have not come into more general use during this period. One reason is purely economic, for after those early days, when the price of copper and aluminium was such that the complete lead sheathed aluminium cable had a real price advantage over the equivalent copper, this advantage disappeared, and it is only comparatively recently that it has returned, and in a much more marked degree. This is due, not only to copper conductor being much more expensive per ton than aluminium, but

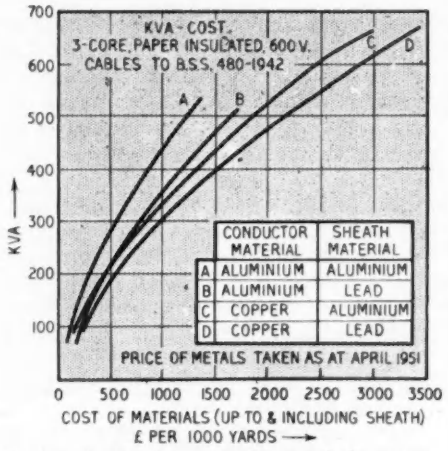


Fig. 1.—Comparative costs of materials for various cables

also to the advent of aluminium sheathing which is cheaper than lead (besides having technical advantages). Evidence from surveys of the future availability of copper and aluminium all indicates that the price advantage of the latter is likely to be permanent. It is, therefore, of practical interest to mention a few very old installations which show that aluminium can be used successfully for cables.

Some Old Installations

In 1909 the first insulated aluminium cable was installed in this country by the Bolton Electricity Corporation: it was low tension single core paper insulated and lead sheathed. This was in satisfactory operation till 1925 when it had to be taken up owing to a change-over to a.c. The same cable was relaid in another locality and was still in use in 1936 for a d.c. traction supply at 550 volts. In 1915 further aluminium cable was installed for traction purposes and was still in use in 1936. It is interesting to record that joints were soldered. This must have been a laborious process as each wire was tinned individually and the complete conductor then plunged into solder into a suitable aluminium lug. Bolted stepped joints also appear to have been used. No trouble was recorded as having been experienced with either type.

In 1910 and 1911 the Manchester Electricity Department laid down some insulated aluminium cable, and of this, some 3,500 yards were in commission in 1936 and 1,500 yards are still in satisfactory service. There is no record of any soldered joints but only of the bolted stepped type. No faults occurred during the time it was in commission, although, at one time, there was a little trouble experienced in terminating the aluminium conductor on to busbars, etc.

The Borough of Ealing also had an early aluminium cable installation, but the date of its installation does not appear to be on record. This was in satisfactory commission till 1930 when four-core copper cables were substituted, presumably because they were then cheaper.

The County of London Electric Supply Co. laid 50 yards of insulated aluminium cable as a trial installation in Whitecross Street, London, in 1910. The inner core had 37 wires of 14 g. aluminium, and the outer was made of segmental aluminium strands: the cable was paper insulated and lead sheathed. In 1911 and 1913

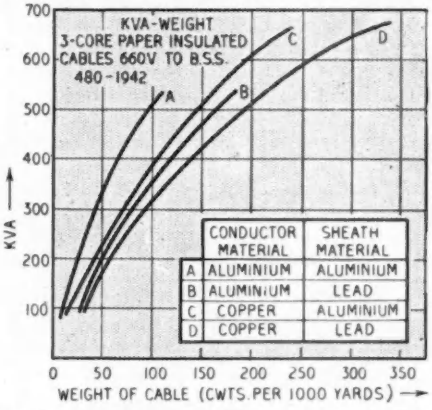


Fig. 2.—Comparative weights of various cable types

two tee connections were made to copper service cables, but in 1935 it was found that the cable was running at too high a temperature owing to the increase in load over 25 years. Accordingly, this cable, which was 0·2 sq inches aluminium area, was replaced by 0·2 sq inch copper. The end joints were soldered using powdered resin mixed with tallow as a flux and ordinary tinman's solder. The joints were of the telescope type. The subsequent service connections were made with some form of standard clamped tee joint as used for copper. It is certainly of interest that no trouble occurred with either of the two types of joint.

Service Life

An interesting example of the use of H.S.O.S. type aluminium cable was in operation until quite recently at Tidworth and Bulford Camps since 1912-1914. The cut-out and fuse-boxes were on the outside of each block and the aluminium cables came straight on to standard

brass terminals employing blunt tipped screws. Although there was the usual clamp-down lid, it was clear it was not hermetically sealed, and, contrary to present day practice, no grease was used. Illustration shows the good condition of the aluminium wires exactly as they were removed from the contacts after nearly 40 years' service.

More Recent Installations

There must obviously be a certain time lag between the time at which aluminium cables became economically favourable and their more general adoption. Except for H.S.O.S. and P.B.J., the use of aluminium in cables in this country (as opposed to the Continent) is, at the moment, very small indeed.

In his Chairman's address to the North Midland Centre of the I.E.E., Mr. H. S. Moody pointed out that it had only recently become economically advantageous to use aluminium cored underground cables and that such installations using these cables were being planned.

In another part of the country, a small test installation of the low voltage multicore underground distribution main conductor with services has been in operation for twelve months, the cable having an aluminium sheath as well as aluminium conductors. This has been done with a view to conducting comprehensive field tests. It is also known that some mine shaft cables have already been installed. A symptom of the changed views towards aluminium is the fact that they may now be found advertised in the technical press. Far greater progress has been made on the Continent; France, for instance, has some 3,400 miles of aluminium cable installed [2] since 1908, the greater proportion of which has been laid since 1939.

In America and Canada, rather unexpectedly, there appears to be very little evidence available on old installations, but some important Utilities such as The Consolidated Edison Co. of New York and the Boston Edison Co., have laid aluminium cables both with paper insulation and with rubber insulation.[2] The Bell Telephone System is about to use paper insulated telephone cable employing 17 and 22 A.W.G. aluminium wires with a sheath of aluminium strip and polyethylene.[2]

General Characteristics

As is well known, the weight of an aluminium conductor is, length for length, half that of copper for equal electrical resistance. The corresponding areas are respectively 1·61 to 1 and the diameters 1·27 to 1. For equal diameter, the ratio of current carrying capacity of aluminium to copper, for the same temperature rise, is taken as 0·84 in the U.S.A., but in this country the more conservative figure of 0·80 is generally used. In that case, the weight of the actual conductor is one-third that of copper. The slightly larger size needed for aluminium is, in the majority of cases, not a great objection and cannot seriously be considered as outweighing the economic attraction.

For the sake of easy reference, a comparison of the salient physical and electrical characteristics of aluminium and copper are given in Table 2. Some comments, however, are necessary on these figures. First, items 4, 5, assume the use of hard tempered aluminium and annealed copper, and allowing for the larger area of the aluminium the resulting breaking load is greater than that of the equi-

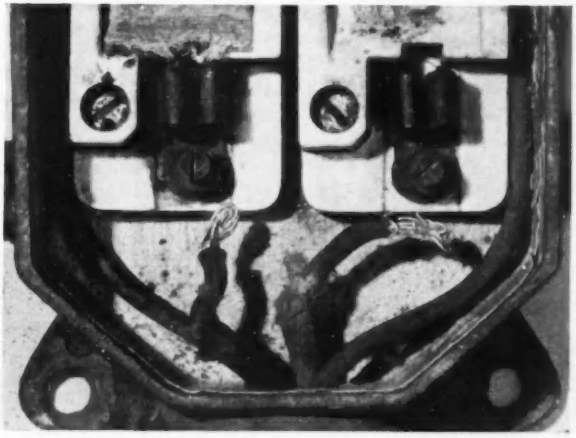


Fig. 3.—This illustrates the condition of aluminium wires after being clamped in ordinary brass terminals for nearly 40 years

valent copper. Second, from items 6 and 7 it can be seen that a considerable difference in expansion exists. It is therefore most inadvisable to use a copper compression sleeve for jointing aluminium conductors. The initial contact resistance will, it is true, be perfectly satisfactory, but a dozen heat cycles, for instance, may gradually increase this resistance to an unsatisfactory degree. There is no such trouble with an aluminium or aluminium alloy sleeve on this account, as there can be no differential expansion. It is possible that difficulties in connection with differential expansion can be overcome by some form of outer clamp which possesses sufficient elasticity to cope with variations in aluminium diameter due to temperature changes.

Other Properties

It is unfortunate that there does not appear to be any record of the temper of aluminium used for the old cable installations, which would give some basis for assessing effects of elongation. Experience on the Continent, however, indicates that, in practice, the smaller elongation of the aluminium does not have any noticeably adverse effect. It should also be borne in mind that aluminium is totally unaffected by rubber or, indeed, by any components used in cables.

TABLE 2.—GENERAL CHARACTERISTICS OF ALUMINIUM AND COPPER

	Aluminium	Copper
(1) Max. Resistivity in microhms/cm³ at 20° C.	2·872	1·724
(2) Specific Gravity ...	2·71	8·89
(3) Coeff. of increase of resistance with temp. per ° C.	0·004	0·004
(4) Typical tensile strength lb/sq in.	25,000	29,000
(5) Tensile strength, lb on basis of electrically equivalent area ...	40,200 (1·61 in²)	29,000 (1·0 in²)
(6) Coefficient of linear expansion per ° F. ...	$12{\cdot}78 \times 10^{-6}$	$9{\cdot}222 \times 10^{-6}$
(7) ditto per ° C. ...	23×10^{-6}	$16{\cdot}6 \times 10^{-6}$

There is a tendency in certain quarters to over-exaggerate the effect of the oxide film on aluminium: it has even been likened to enamel insulation! This is, of course, a confusion of thought with the thick film purposely produced by the anodic process for insulation. It is true that the natural oxide film is always present on aluminium since re-oxidation commences directly the film is broken by abrasion or pressure. The important point is that the thickness (and hence insulating properties) of this film are kept within reasonable and harmless limits as long as adequate pressure is maintained at contact surfaces. If an aluminium surface is exposed to the air, this film does undoubtedly thicken, but it tends to inhibit its own growth as the thickness increases. Having seen the characteristics of aluminium as a metal, the more specific case of the jointing of the complete insulated cable can now be considered.

Jointing with Solders

In view of the favourable economic advantages of aluminium it may safely be said that it will become in general use as soon as the vastly improved techniques of jointing become more widely known. The various methods discussed quite briefly below cover joints used for the complete range of multi-strand and single wire insulated cables. Aluminium-copper junctions and soldered joints must be protected from moisture to avoid risk of electrolytic action, but in most cases insulated cable joints are well protected.

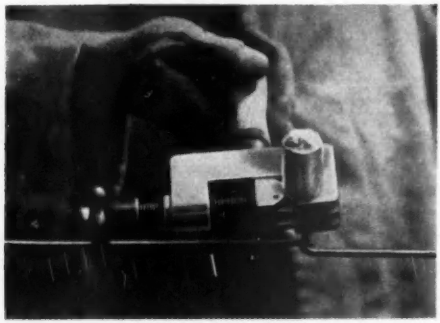


Fig. 4.—The special tool and wires prepared for Alutherm fusing. Note the thermite cartridge in position

It is common knowledge that successful soldering of aluminium depends on the removal of the aluminium oxide film by practical means, and it is indeed of some historic significance that the statement "Aluminium cannot be soldered" is, as the result of recent research, no longer true. In the meanwhile, there are already installations of multi-strand aluminium cables in this country using soldering methods which, as a result of recent tests, have given cable makers sufficient confidence to justify the sale of both aluminium cables and solder, together with the special non-corrosive flux. This appears to be a most important step forward particularly as it should mean the minimum of change in the soldering methods to which jointers are accustomed. Some cable makers in this country are using American

solder and flux, and others have adopted variations. In any case, it is expected that production in this country will soon be in sufficient quantity to obviate buying from America for dollars.

In using aluminium solders there are two important points to remember: (1) that it does not flow as readily as solder for copper, and (2) whereas it is usually quite obvious whether a copper surface has been properly wetted by the solder, it is not obvious with aluminium. Clearly this can be as bad as a dry joint in the case of copper. As long as this point is appreciated and a simple necessary precaution taken, this does not represent any serious objection: it is merely necessary to rub off the surplus solder while still molten and it will be quite clear whether the surface is wetted or not. Once this point is established the subsequent procedure hardly differs from that with ordinary tinman's solder.

There are slight variations of this solder, and flux, but the method of use is essentially unaltered. The normal precautions for cleaning are the same as for copper; the aluminium wires are cut so that cable end is stepped, this is to expose the maximum of surfaces to the solder and overcome the difficulty of the comparative lack of flow between wires already mentioned. The end is fluxed and the solder ladled over it, this process is continued until the wires are sufficiently heated and wetting takes place as indicated by wiping with a cloth. The last action must be the pouring of solder and not the fluxing. A standard weak-back tinned copper ferrule is then applied and more solder poured so that the spaces in the stepped end are filled and a solid joint results. While the above technique can equally be applied to single wire cables, there are other methods which would appear to be very advantageous, such as cold welding, flash welding, and compression, discussed later.

A further method is hard soldering or brazing. This has been tried out, but has two disadvantages: (1) a corrosive flux is used and there is absolutely no certainty in a multistrand cable that the deliquescent residue can be thoroughly cleaned off, and (2) there is grave risk of damaging insulation owing to the high soldering temperature necessary.

Ultrasonic Jointing Methods

Another extremely interesting method of tinning and hence making soldered aluminium joints is by the ultrasonic method. Briefly, this consists of breaking up the oxide film by vibrations of a frequency just outside audible

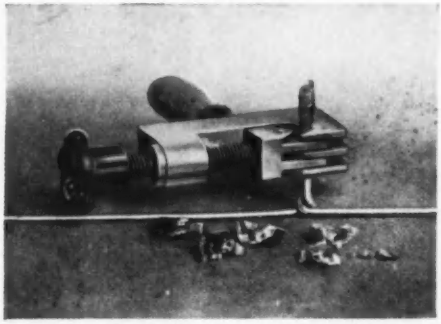


Fig. 5.—Alutherm fusing process completed with remains of thermite cartridge removed

frequency. This can be done in two ways, either (1) with an electric soldering iron whose bit is vibrated by a magneto stricture electronically operated, or (2) in a molten solder bath vibrated by a similar electronic device. Experiments have shown that the method of dipping the grease-free cable end into the molten bath is satisfactory, particularly as a reasonable amount of interstrand penetration appears to take place. Once the cable end is tinned there is, of course, no further problem. This method can be applied to single wires, but it must be remembered that very fine wires are liable to be eroded severely.

Cold Welding

It is generally considered that welding consists essentially of breaking up the aluminium crystals around the surfaces to be jointed, with the result that re-crystallisation takes place across the original line of demarcation which is thereby eliminated. In the case of gas welding, the break-up is effected by the actual melting of the aluminium. The interesting discovery was then made that the same effect could be produced even at temperatures below melting point by exerting sufficient pressure. To get the best results, however, the temperature and pressure had to bear a certain relation to each other and, in any case, the temperature used was still high enough to anneal or partially anneal the aluminium.

The next development was cold welding, which can be carried out at room temperature and thus has the advantage of not softening the aluminium. In this case, however, there is evidence that no re-crystallisation takes place across the original line of demarcation. In the process, heavy pressure is used sufficient to deform the aluminium by some 75%. The joint can be effected either by overlapping

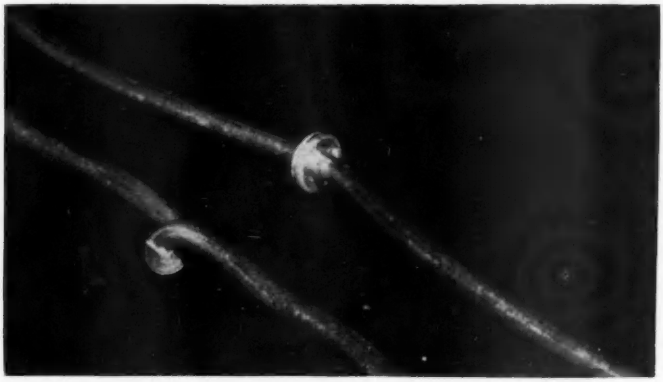


Fig. 6.—A cold butt weld is shown here with the flash untouched. In the second example the join has been twisted and bent

wire ends and heavily indenting, or by simply butting the ends under pressure, and generating sufficient flow of metal to cause the type of flash normally associated with fusion welding. This process can be applied to single wires in a large range of sizes, but the practicability depends on the pressure which can be brought into operation. For instance, it would be impossible to weld $\frac{3}{8}$ in. wire with a hand-operated tool, but it has been done successfully as a commercial proposition with 16 g. aluminium wire. As long as reasonable care be taken to see that the wire is clean, this method, which requires no flux, employing a proper design of hand-tool, would appear to be fool-proof for single wires such as are used, for instance, in aluminium telephone cables. This method has, in fact, already been successfully employed commercially for this purpose; it has not been developed for multi-strand conductors.

Fusion Welding

Electric flash butt-welding without flux using a standard welder gives satisfactory results on both multi-strand and single wire conductors. In the former case, using a special but easy technique, it appears to work well with flexible aluminium cables where the number of wires may be 1,000 or more and the wire diameter as small as 34 g. (0·0092 in.). The heating cycle lasts such a short time and heat is carried away so quickly by the aluminium that rubber insulation, adjoining the weld, is unaffected. Another interesting method of electric welding consists of twisting the aluminium wire ends and subjecting them to the discharge of a condenser. Like the electric flash welding method mentioned above, this method is quick, simple, and also requires no flux. Gas welding, as in the case of brazing, necessitates the use of a flux which is deliquescent and corrosive, but apart from this, the time taken is longer than in the case of flash welding and it is very difficult to avoid damage to the insulation caused by heat travelling along the conductor.

Thermite Welding

This method has been developed on the Continent and has been in use for many years for jointing bare overhead aluminium conductors. Briefly, this consists of surrounding the ends with a special thermite cartridge in which the reaction takes place, and the heat generated is sufficient to melt and fuse together the ends of the aluminium wires. An important point is that before the reaction is started, certain springs are caused to be under compression; as the thermite reaction takes place, these springs exert sufficient pressure to press the melted conductor ends towards each other and thus eliminate the risk of contraction strains on cooling. Obviously, no such movement is possible in the case of insulated cables, but a special technique is being developed to cope with this special problem.

A variation of this method is used for jointing single wires. The ends are twisted and then gripped in a small aluminium alloy hand-tool. The thermite cartridge is then thrust over the ends and the reaction started by a fusee match. The wire ends are fused together, making a perfect electrical joint; since the wire becomes annealed this joint is only intended for non-tension positions. The tool acts also as a chill to reduce the flow of heat along the wire.

Clamping

Under this heading may be considered compression joints and joints of the bolted type. Compression joints may consist of a soft

Fig. 7.—This is an example of an overlapped and pinched joint. The twist acts as reinforcement in cases where movement could possibly cause fatigue

aluminium sleeve of oval section compressed into a circular shape so that the ductile aluminium even flows to a certain extent into the spaces between the wires. Such joints are standard practice for overhead lines where conditions are obviously much more severe than with underground cables. In the case of overhead lines, however, the sleeves have to be a certain length to attain the necessary grip and this length is greater than that necessary to give an overall resistance less than that of the same length of unjointed conductor. In many ways, compression is ideal for cable as well, and it is understood to be in use in the U.S.A. for this purpose. It is not quite clear whether sufficient length of sleeve can be accommodated in the types of jointing boxes used in this country. Another form of compression joint more suitable for small stranded cables or insulated wires consists of pinching or crimping a sleeve by some form of hand tool; this method has been used successfully in the States and this development is being actively followed up in this country.

A type of hammered compression joint has been used on the Continent for cables up to about $\frac{1}{2}$ in. diameter. The aluminium conductor is slipped into a soft aluminium sleeve, whose exterior shape is oval, and this is then held in a circular groove between upper and lower dies. The dies are then hammered together until the two halves meet. Assuming the correct dies are used, this method is practically foolproof and quick; there must, of course, be space to weld a heavy hand hammer and there must be a firm stance for the dies.

Bolted or screwed joints, as already mentioned, have undoubtedly given satisfactory service over periods up to 40 years, but in many cases their bulk is a disadvantage. H.S.O.S. cable service in l.t. distribution are terminated in standard fuse-boxes as for copper, except that it is advisable to use grease (in spite of the experience quoted above at Tidworth). It is important, however, that the screw should have a blunt head, in other words, it is better, with aluminium, to have a lower specific contact pressure over a larger area rather than a higher specific pressure over a smaller area. Some of the B.E.A. Area Boards are now using this method.

It seems desirable at this stage to strike a warning note : aluminium was first used as an electrical conductor in the form of bare overhead wire some 52 years ago and, as was perhaps inevitable with a new, promising development, enthusiasm outran caution to such an extent that failures occurred. As a result, the development of this application was held back and it was the potent argument of economy that forced development once more to see whether such failures could not be avoided : the result is seen today in some millions of miles of S.C.A. and plain aluminium conductors in successful operation all over the world.

Attention is drawn to the above to emphasise the vastly improved position nowadays in view of the accumulated experience with aluminium, much of which will be applicable to cables : there have also been quite recently developed the new and promising techniques mentioned above, which should make a very important contribution to successful jointing. So far as the actual aluminium cores are concerned, they should outlast their insulation if the experience of 43 years is any criterion.

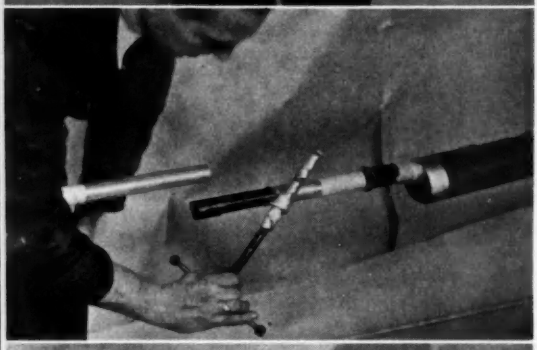
REFERENCES.

1 These charts, "Application of Aluminium in the Construction of Insulated Cables," P. M. Hollingsworth. Paper read before Mining, Electrical and Mechanical Institute of South Africa and Rhodesia, November, 1951.

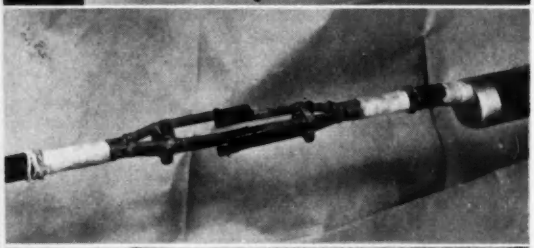
2 H. W. Biskeborn, "An Historical Review of Aluminium Application in Insulated Conductors."

The Technique
ALUMINIUM

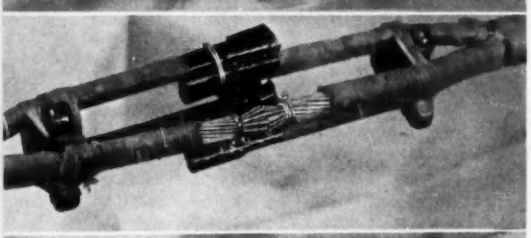
The top picture shows the sheath being tinned to take the lead sleeve after completion of jointing. The process involves removing the oxide film by filing, then applying the special solder (90% tin, 10% zinc) and finally wire-brushing the prepared surface. This is done first to avoid possible damage to the insulation which might occur if the process was carried out with the sheath removed



Removal of the sheath is next required. A diagonal saw cut is made in the sheath at the cut end, and a circular groove cut round at the back end where removal is to stop. After lifting the corner of the aluminium with pliers, it can be removed by the special tool as shown. Note that the tinned sections are taped to keep them clean



The sheath having been removed, the belt paper insulation is taken off to reveal the individual cores. Impregnated cotton tape is bound round as shown to prevent ingress of moisture into the papers and to protect the individual core insulation. Hardwood spacers are used to splay the cores so that the joints can be made

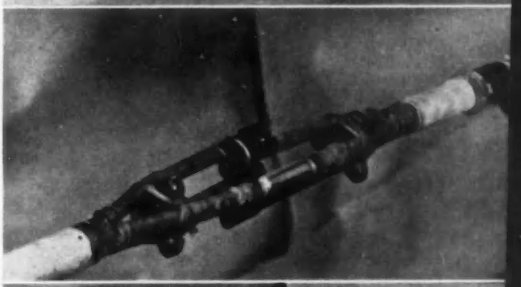


Wire is used to bind two of the cores to be jointed, whilst the third is marked off and cut to give a butting joint. The core insulation is removed and the outer layer of wires cut back, the inner wires being splayed. The cut back distance and the number of "steps" depend on the conductor size

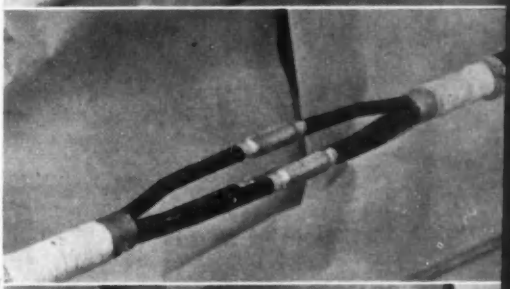
The exposed portions of the conductor are tinned by firstly pouring over them the aluminium solder—previously heated to the correct temperature—until a stick of solder melts when brought into contact with the strands. (The solder used has a tin/cadmium/zinc composition.) A special flux is then applied by brushing on to, and into the interstices of, the heated strands. The application of the molten solder and the fluxing are repeated alternately until the wires exhibit a brightly tinned surface and freedom from dull spots. This process is illustrated in the bottom two pictures

# of Jointing CABLES

Here, a tinned copper ferrule, the size of which again depends on the conductor size, has been opened out and closed round the cores. The ferrule at this stage is not completely tightened on to the strand. Note that the ferrule covers practically the whole exposed length of the cores, the "steps" being inside with the conductor butt in the centre



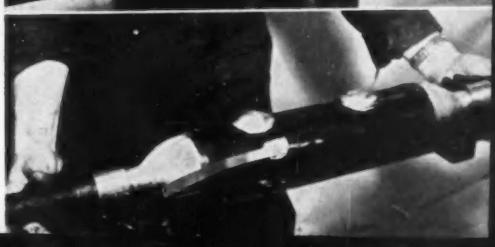
Solder is now poured again from ladle to ladle into and over the ferrule, and the ferrule tightened. Further solder is now applied to fill completely the space within the ferrule, and when the metal has cooled to a semi-molten condition, the surplus metal is removed to leave a smooth joint



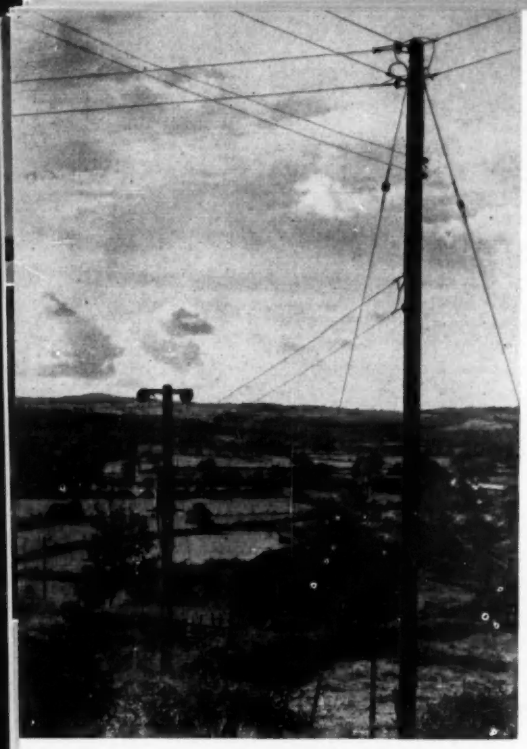
The same process is followed in turn for each core, and when completed the joint looks as shown. The hardwood spreaders are removed, together with the impregnated cotton tape used as protection for the individual cores. The protective tape on the belt papers, however, is left

It is now necessary to apply insulation over the joints. This is done in the conventional manner by applying layers of impregnated cotton tape to each jointed core together with an overall binder as shown. The insulated joint is now completed and ready for the outer sleeve to be drawn over

The lead sleeve is now drawn over the insulated joint and the ends dressed down to come into close contact with the previously tinned sections of sheath. Plumbing to the sheath is carried out with ordinary plumber's metal H



Finally, the sleeve is compound filled, the bonding strips fitted, and the sleeve joint encased in a compound filled iron box. These illustrations were kindly prepared by Messrs. Johnson and Phillips and show the actual jointing of a 0·15 sq.in. 3-core 660-volt cable with aluminium cores and sheath



Distribution with ALUMINIUM

EXPERIENCES IN THE UNITED KINGDOM

described by A. W. MATKIN, A.M.I.E.E., A.M.I.I.A.

AS a result of the recent shortage of copper, and its high price, the electrical industry has been considering seriously the use of aluminium as an alternative. Before any policy decisions are made on this question, those responsible naturally wish to satisfy themselves, not only from the technical aspect, but on the question of future supplies and their relative cost. The purpose of this article is to review these problems in the light of present-day experience and information.

Future Supplies and Prices

A recent article entitled "Aluminium versus Copper," published in *Modern Metals* in May this year, describes in detail the supply position. It points out that world supplies of copper will continue to be expensive and somewhat limited in relation to demand because of the increasing difficulties of mining. On the other hand, world supplies of bauxite from which aluminium is obtained, are almost unlimited and are easily accessible. The limiting factor so far as aluminium production is concerned is the provision of cheap hydro-electric power which is essential to the economic production of aluminium. The increase in hydro-electric power combined with new and projected aluminium refining plants makes it reasonably certain that aluminium will continue to be in plentiful supply at stable prices.

These facts are confirmed by a comparison of aluminium and copper prices over the last fifty years which are clearly indicated by the graphs in Fig. 1. It will be seen how the trend of copper prices has been upwards, particularly since 1946, whilst the trend of aluminium prices has been to fall gradually and only rise comparatively slowly since 1946. Early in 1946, the price of copper was £5 per ton above the cost of aluminium. At the time of writing the copper price is £119 per ton above the cost of aluminium and the indications are that this price difference will continue. Because aluminium has a lower specific gravity than copper it will continue to be economic to use aluminium conductors in place of copper conductors until the basic price of copper is about half that of aluminium.

Application to Low-tension Work

Whilst steel-cored aluminium conductor has already been widely used for both technical and economic reasons, all-aluminium and aluminium alloy conductors such as "Silmalec" have not been used much in this country to date, although they have been adopted widely abroad. It is generally accepted that aluminium as a conductor is satisfactory but the first essential for the development of homogeneous aluminium conductor is the provision of suitable fittings. These are now available and it is significant that most of the Area Boards in this country, in addition to supply authorities abroad, have already erected experimental all-aluminium and aluminium alloy lines, and many of them have advanced beyond the experimental stage.

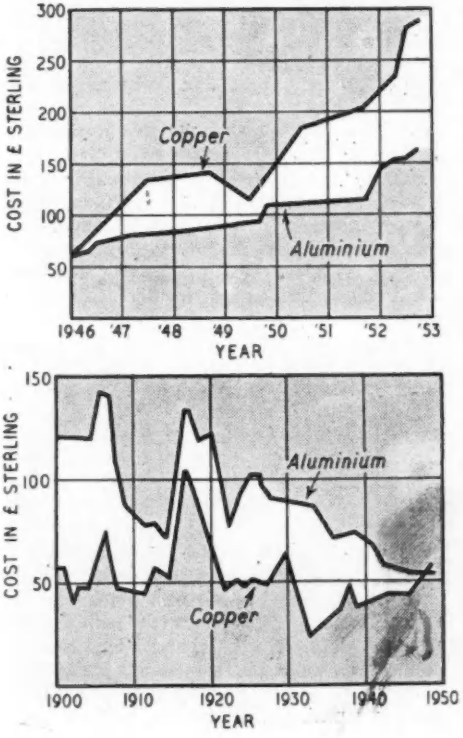
Experiences with high-tensile aluminium

The heading block shows a general view of all-aluminium low-tension distribution

alloy conductors have been reviewed elsewhere, and the following observations are concerned chiefly with the use of all-aluminium conductors. These conductors have a comparatively low tensile strength and consequently, are more suitable for use on low-tension networks.

In this country spans on low-tension distributors do not usually exceed 50 yards, or 60 yards at the most. In order to reduce the size and cost of supports, copper conductors are not usually erected to their normal working tension, but to reduced tensions of about 1,000 lb for 0·05 sq in. copper equivalent conductors and 1,350 lb for 0·1 sq in. copper equivalent conductors. Comparative sags between copper and all-aluminium conductors are shown in Fig. 2, from which it will be seen that aluminium can be substituted for copper and the same spans, poles, stays and spacings can still be used. The only other factor to consider is that of the increased windage due to the slightly larger diameter of aluminium conductors compared with their electrically equivalent copper conductors. In practice, this increased windage varies between about

Fig. 1.—Price comparisons of copper and aluminium from 1900-1946 and 1946-1953



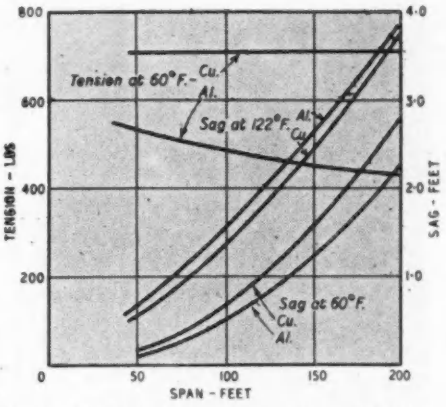


Fig. 2.— Comparative sags for copper and aluminium lines

5% and 10% and as most poles have a good margin of strength, this factor can normally be neglected.

It will, therefore, be appreciated that aluminium can be most readily substituted for copper on low-tension work because no redesigning of of the lines is necessary, and also because fewer types of fittings are required. Not only are the economic advantages greatest when aluminium is used for low-tension work, but the greatest savings in weight of copper can be achieved.

Erection Experience

Although aluminium conductors have been erected to the same maximum working tensions as copper, every-day working tensions with aluminium have been less. This has often resulted in stay wires appearing quite slack while the conductor has appeared to be taut. Where soil conditions are unfavourable, this has proved a definite advantage from an anchoring aspect.

Standard binding-in practice has been used, employing 8, 9, 10 and 11 s.w.g. half-hard aluminium binding wire according to the size of the conductor, the length of bind normally being somewhat longer than with copper. Aluminium armour tape has generally been applied to the conductor at insulator points and underneath binding wire. Fig. 3 shows a typical type of insulator bind.

It has been found that the care needed in handling aluminium conductors has been exaggerated. In practice, the lighter weight of aluminium compared with that of copper has made it easier to handle, and reduced labour costs have been possible. Also, the risk of abrasion has been lessened because of the

Fig. 4.—An all-aluminium service line and (Fig. 5) Right: close-up of all-aluminium service connection

reduced drag, and it has only been necessary to adopt normal precautions to prevent abrasion from rock-like surfaces. Standard types of come-along clamps and draw vices have been used with the addition of emery cloth to assist gripping and prevent abrasion. There has been a preference for the aluminium alloy type of come-along clamp. Where conductors have been over-tensioned by 7-10%, or pre-stressed, no stretching of the conductor appears to have taken place after erection. In a few cases, where no pre-stressing or over-tensioning has been carried out, slight increases in sag have occurred.

Suitable aluminium earthing equipment is not available and the earthing of aluminium networks has invariably been carried out in accordance with local practice using copper earth wires and equipment. Bi-metal fittings of the types described later in this article, have been used when connecting the earth wire to the aluminium neutral conductor at the top of the pole.

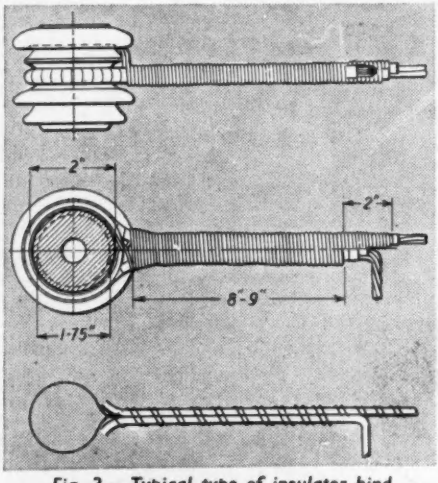


Fig. 3.—Typical type of insulator bind

Services

Aluminium H.S.O.S. and P.B.J. cables have been widely used and the general practice has been to connect aluminium services into the supply cut-outs. Although supply cut-outs are normally fixed in dry situations and the terminals are usually made of tinned brass, it has been a common practice to apply a specially selected long-life grease at the connection points to protect the conductor against possible electrolytic action. The types of line taps which have been used include adjustable aluminium alloy parallel groove clamps, aluminium alloy split-bolt line taps, and tinned brass split-bolt line taps with grease filled shrouds. Here again the general practice has been to use the above special grease when assembling these fittings. Following copper practice, split-bolt line taps have proved most popular, but many engineers have preferred the parallel groove type of fitting because of the greater contact area. In the comparatively few cases where copper services have been connected to aluminium lines, bi-metal line taps have been used. Figs. 4 and 5 illustrate a typical service line connection with P.B.J. sheathed aluminium cable, and a bare neutral conductor terminating in a compound filled joint box. Twin 7/·083 in. aluminium H.S.O.S. cable is run from this joint box, to the supply

cut-outs. Another method of service connection has been to connect single aluminium H.S.O.S. cable direct from the distributor to the cut-outs.

Fittings

The other types of fittings which have been generally used have consisted of aluminium alloy parallel groove clamps for non-tension connections, and various forms of well-known bi-metal fittings for connections to transformers, pole boxes and other control gear.

The special long-life grease already mentioned has normally been applied to the aluminium conductor and fitting during assembly, and the recommended practice of cleaning the conductor before assembling the fitting has usually been followed. Figs. 6 and 7 illustrate some of the types of bi-metal fittings which have been used, whilst some typical examples of their installation are shown in Figs. 8 and 9. These fittings all employ the well-known principle of separating the exposed aluminium and copper parts with a moisture-resisting washer. In the comparatively few cases where mid-span joints have been required, torsion sleeve joints have generally been used up to the present.

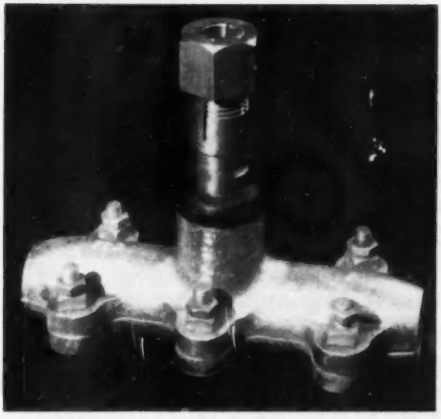


Fig. 6 (above).—A bi-metallic full current tapping

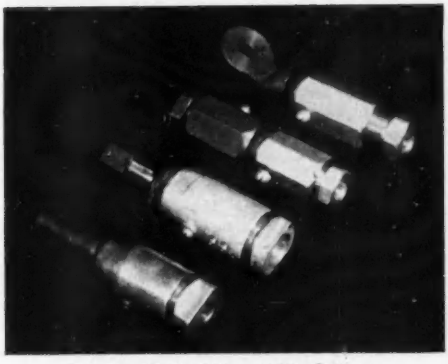


Fig. 7.—Typical bi-metallic fittings

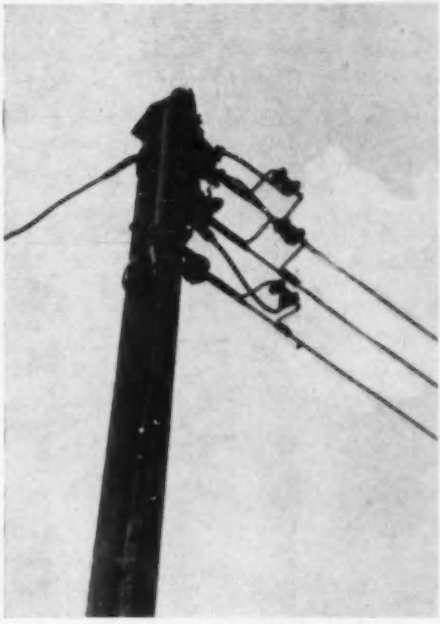


Fig. 8.—Bi-metallic connection at a pole box

Unfortunately, no general specification covering the design and manufacture of all types of fittings for aluminium conductors has yet been issued or adopted. This has inevitably resulted in fittings of unsatisfactory design or construction being used. There have, for example, been cases of fittings being manufactured from unsuitable alloys, or with porous castings. There have been other cases of inferior plating of nuts and bolts, and of bi-metal fittings with inefficient moisture sealing arrangements.

It cannot be emphasised too strongly that the composition of the metal used for fittings is really just as important as that of the conductor; aluminium of the requisite high purity having a high resistance to atmospheric corrosion will, nevertheless, be liable to sacrificial corrosion if the composition of the fittings' metal is incorrect. It is, therefore, most important that in cases where pure aluminium is used (such as torsion sleeves) a purity of not less than 99·5% be specified.

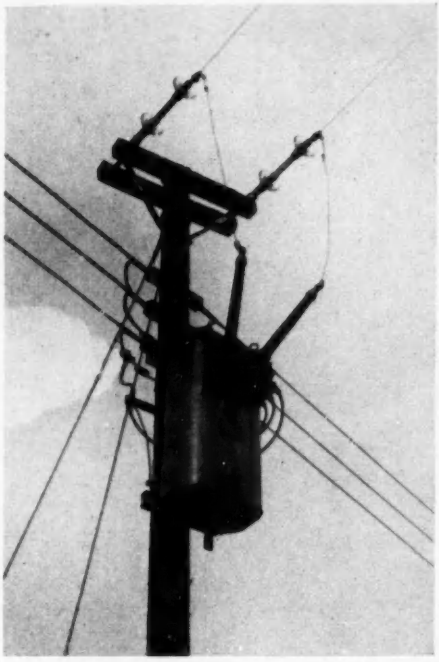


Fig. 9—Bi-metallic connections at a transformer

Most fittings employ aluminium in the cast or extruded form in order to obtain adequate strength. Here again it is most important to avoid scrap material and, in particular, alloys combining even small quantities of copper and zinc which are a very dangerous combination. Among the safe and generally satisfactory casting alloys is LM-6M containing 10-12% silicon, and those containing magnesium and silicon are very suitable in the wrought range.

These matters are mentioned because it is felt particularly that the question of the design of fittings and their manufacturing specifications should receive the closest attention of all engineers who are using aluminium. It may be recalled too that aluminium conductors have sometimes received unwarranted criticism when unsuitable or badly assembled fittings have been used.

The latest trend is towards compression fittings of all types and these fittings are now available in a large range of sizes. The use of compression fittings generally has been retarded because of the lack of suitable compressors, but this difficulty has now been overcome by the production of portable, lightweight 9, 20, 50 and 100 ton hydraulic compressors. The introduction of the "bolt cropper" type of compression tool for compression line taps has appealed to many engineers and has provided a cheap and efficient service connection. In fact, recent fault current and tensile tests which have been made on joints compressed with a "bolt-cropper" tool indicate that this type of joint can be used satisfactorily for small non-tension joints, and even tension joints, in addition to line taps.

Conclusions

All-aluminium conductor is made from the same electrical purity aluminium as that used for the manufacture of steel-cored aluminium conductor. Steel-cored aluminium conductor has, of course, been erected throughout the world for many years and has been proved to be an eminently suitable conductor in many varying climates. The fact that all-aluminium conductor is homogenous is particularly advantageous from the fittings aspect. Experience and extensive tests have shown that aluminium conductor will withstand extreme tropical and marine conditions provided that special grease is applied internally to the conductor during manufacture. Similarly, saline and tropical conditions do not adversely affect the life of fittings provided that special grease is used when assembling the fittings. It must be stressed, however, that grease will not afford adequate protection of fittings which are made of unsuitable alloys nor will it compensate for inferior plating.

It is recognised that aluminium is liable to be affected externally by exposure to certain atmospheres in the same way as copper. For instance, polluted industrial atmospheres will reduce the life of both aluminium and copper conductors, and fittings. Fortunately, atmospheric pollution of this kind has not often been found in localities where overhead lines are erected. Long overseas experience and limited experience at home during the last forty years, indicate that the average life of aluminium lines is not less than that of copper lines and this would certainly seem the logical basis on which to work when considering planning policy.

All-aluminium low tension schemes have shown total savings of at least 25% compared with similar copper schemes. With present day prices it is considered that capital savings of over 30% can be made.

The writer wishes to express his grateful thanks to the Aluminium Wire and Cable Company Limited, for making available to him all the necessary information and photographs published in this article.

AMERICAN VIEWPOINT

THE American views on the use of aluminium were discussed at some length at the A.I.E.E. General Meeting in New Orleans held last month. Mr. H. W. Biskeborn, dealing with European practice, said that jointing methods were favoured in the following order; autogenous welding, pressure connections and soft solder. Some comment was made on the use of autogenous welding and views were expressed that too much heat needed to be applied with consequent damage to insulation. Mr. Robert Nordell pointed out that Sweden had not used insulated aluminium to date, but he favoured the compression joint.

Mr. C. P. Xenis, described tests carried out on aluminium busbars by Consolidated Edison. Stacked aluminium sheets showed a minimum contact resistance at 18,000 lb/sq in. and which remained low even when the pressure was reduced to 1,000 lb/sq in. Mr. E. J. Casey (G.E.) described work carried out on silver-plated aluminium joints, which, he stated, held their initial resistance much better than non-plated joints. Mr. C. W. Zimmerer reported that Underwriters Laboratory tests had shown the load-carrying capacity of aluminium conductors to be 78% of equivalent copper section.

Practical experience was cited by E. E. McIlveen (Okanite), who suggested that three-quarter hard temper aluminium was the best for all-round performance. As aluminium had a 40% higher coefficient of expansion than copper, good practice suggested that allowance should be made in manholes for extra cable movement. Aerial cable was one of the more desirable applications of insulated aluminium conductors; in this connection, compression type fittings were more or less foolproof and gave good performance as terminals, straight connectors or tees. Fittings were also discussed, mainly by Messrs. Joel Tompkins and E. K. Lanetot (Aluminium Co. of America) and by W. F. Bonwitt. The latter considered that galvanised hardware seemed unsatisfactory, but silicon bronze equipment was satisfactory if it had been tin-plated.

Availability of Aluminium Cables

THERE are two uses for aluminium as used in the cable making industry: as a conductor and as a protective sheath, and these may be independent or combined. For example, it is possible to obtain lead-sheathed cable with aluminium conductors, aluminium-sheathed cable with copper conductors, or all-aluminium cable with both conductors and sheaths of aluminium. There are also a great variety of other cables with various coverings available with aluminium cores.

Production

The laying up of aluminium conductors presents little difficulty as far as the cable manufacturer is concerned. All, in fact, that is required is the substitution of aluminium wire in place of copper, on the cable-making machines; together with the appropriate adjustments. Several firms, among them Pirelli-General, Johnson and Phillips, British Insulated Callender's Cables, Sterling Cable Co., and W. T. Glover, are in a position to supply cables with aluminium stranded conductors. The most general range being manufactured at the moment is, of course, the power range covering 660 volt 3- and 4-core, 3·3 to 22 kV and 33 kV. Smaller sizes and special types such as H.S.O.S. and P.B.J. or equivalents are also manufactured, as well as the high voltage types which are usually to special order.

Aluminium sheathing is, however, at the moment only in large scale commercial production from Johnson and Phillips, Pirelli-General, and B.I.C.C. This is mainly due to the difficulty in applying the sheath. Both the Johnson and Phillips method and Pirelli-General's system have been described at length in the ELECTRICAL TIMES, the former in our issue of September 25, 1952, p. 546, and the latter in our issue of October 16, 1952, p. 694.

In the Johnson and Phillips method, the core is pulled into a previously extruded aluminium tube or sheath by means of a most ingenious electro-magnetic system and the sheath is then cold worked down to fit the cable. The Pirelli-General method uses a continuous welding process whereby the sheath is actually wrapped round the core and then welded. The latter process produces a corrugated sheath, which it is claimed has remarkable flexibility in that it requires little effort to bend it and it can withstand repeated bending on diameters appropriate to lead sheathed cables without damage or distortion to the sheath.

Most of the firms concerned have leaflets and specifications available describing their available ranges, and including methods of jointing, and reference should be made to these prior to ordering.

ALUMINIUM *sheathed* *Gas Pressure Cables*

IN 1951, British Insulated Callender's Cables, Ltd., manufactured and supplied the first 33 kV 3-core aluminium sheathed impregnated pressure cables in the world.

Details of these installations, in which over 11 miles of these cables were laid by British Insulated Callender's Construction Co. Ltd., in 1951 are as given in Table 1.

TABLE 1.—LOCATIONS AND LENGTHS OF INSTALLATIONS

Supplied to	Location	Conductor size	Length (yards)
London Electricity Board	Perth Road, Buckhurst Hill	0·15 sq in.	10,690
Midlands Electricity Board	Halford Lane to Handsworth	0·30 sq in.	3,610
Midlands Electricity Board	Halford Lane to Freeth Street	0·30 sq in.	5,700
	Total Length:		20,000

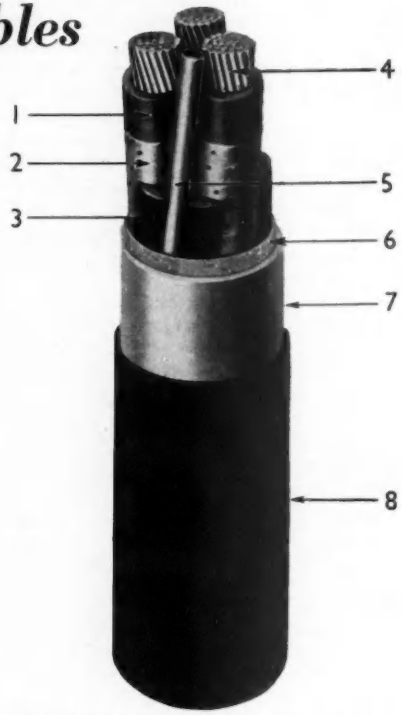
The make-up of one of these cables is as shown in the accompanying photograph, the principal dimensions of both being given in detail in Table 2.

TABLE 2.—PRINCIPAL DIMENSIONS

Component	London Electricity Board		Midlands Electricity Board	
	Thickness inch	Cumulative diam. inch	Thickness inch	Cumulative diam. inch
Conductor ...	—	0·504	—	0·721
Dielectric (including M.P.)	0·123	0·750	0·113	0·947
Over laid-up cores, and gas pipe ...	—	1·616	—	2·041
Over copper woven fabric tape binder ...	0·020	1·656	0·020	2·081
Over aluminium sheath ...	0·095	1·911	0·115	2·376

The sheaths of both these cables were protected by means of an anti-corrosive serving (double rubber-bitumen sandwich).

Manufacture of the cables did not differ from that of lead-sheathed types. The aluminium sheaths were in the form of seamless tubes, each drum length being sheathed from a single billet length of tubing, thus eliminating weak spots associated with welds between billets. The material standardised by B.I.C.C. for aluminium sheaths is to Specification T.I.B.



BICC 33 kV, 3-core, aluminium sheathed impregnated pressure cable

REFERENCES

1. Dielectric. 2. Metallised paper screen. 3. Impregnated paper fillers. 4. Stranded tinned copper conductors. 5. Gas channel pipe. 6. Copper woven fabric tape. 7. Aluminium sheath. 8. Protective finish

of B.S. 1471: 1949, except that the copper content is held to less than 0·03% instead of the slightly larger content permitted in that Specification. Standard lead sheath thicknesses were used offering an advantage over lead sheaths in providing a safety factor of at least 4 on the ultimate tensile stress of the material when the sheaths are stressed by the maximum permitted internal gas pressure of 250 lb/sq in. Because of this ability to withstand such internal pressure, over-sheath metallic reinforcement tapes (essential to lead-sheathed cables) were dispensed with. The elimination of reinforcing tapes obviously reduced the cost and weight of the cables and it also had considerable technical advantages. In order to obtain satisfactory performance from rein-

Cables were pulled into trenches as shown above. The bending radius possible (below) was practically the same as for l.c. cables

forced lead-sheathed pressure cable it is necessary to exercise extremely careful control over the sheathing and over the application of the reinforcement and it is also necessary to use considerable care in the jointing of the reinforced sheath. These technical difficulties have been successfully overcome as the existing 180 miles of lead-sheathed impregnated pressure cables show. Nevertheless, the removal of the need for such close control in the manufacture of the sheathing and associated reinforcement is a marked technical advance.

Handling and Jointing

The reduction in the weight of the cable by the use of aluminium sheathing facilitated handling and installation, support and racking arrangements were simplified, and no special precautions against vibration, ground subsidence or sheath deformation were necessary. Though somewhat stiffer than the lead-sheathed type, the bending radii are practically the same.

Jointing followed normal practice, standard boxes and sleeves being used; wiped joints, for which a special technique is required, were all made without any difficulty.

These installations were virtually complete by mid-1951 and, 22 months later, inspections of the cable sheaths at six different places showed the sheath to be consistently clean and free from corrosion. Subsequently it was agreed with the customers that a similar inspection would not be necessary for another five years.

New Government Research

EXTENSIONS in the work of two D.S.I.R. research organisations, as a result of their being housed in new premises, are noted in reports published by the Stationery Office.

Hydraulics research is the subject of the first of the new stations, and the appropriate report covers the years 1947-1951. This establishment was set up as a result of a memorandum from the Institution of Civil Engineers, which pointed out the need for a hydraulics research station which could deal with such civil engineering problems as coast erosion, flood protection and the silting and scouring of rivers, estuaries and harbours. This work is mainly carried out with the aid of models, and a suitable site for housing these has been acquired near Wallingford, on the banks of the Thames.

Included in work that the organisation has already undertaken is the consideration of a weir design for use on the River Eden, which will ensure adequate cooling water supplies for the Willow Holme (Carlisle) power station, while meeting required flood relief conditions. A larger scheme of electrical interest now under way involves a model investigation of the proposed Severn Barrage.

The Mechanical Engineering research board and the associated station were set up somewhat earlier, but it has only recently begun to occupy new premises at East Kilbride. As a result of this development, the engineering division of the N.P.L. is stated to have ceased to exist as such. The report for 1951 emphasises that the various moves involved caused considerable interruption of research activities.

Work on the fatigue of metals concentrated on size effect, and tended to confirm that stress gradient, as well as maximum stress, is an important factor in performance. The effect of small periodic increases of stress and temperature on the creep of molybdenum-vanadium steel steam pipe was also continued. The hydraulics section started on a programme of instrument research and development having special reference to the use of electronics.

Amongst items of interest in the heat transfer section is the investigation of the effect of an abrupt change in the diameter of a pipe on the heat transfer from the pipe to a liquid flowing through it. Work on behalf of the section at the College of Technology, Birmingham, is concerned with steam condensation.

ACCURACY IN COAL SAMPLING

TESTS on the accuracy of British Standard methods of sampling coal are described in a paper presented to the Institute of Fuel on Tuesday last. Read by MR. E. H. M. BADGER, B.A., F.R.I.C., M.Inst.Gas.E., the paper records the results of consideration of existing standards in the light of recent American work.

In previous work it had been found that there was a general tendency for the average error of sampling to increase with increasing ash content of coal A new theory offered the hope of finding out more about the cause of this variation.

Twelve tests were carried out by the Committee, nine of them on single wagons of untreated smalls. Samples of various weights were taken, but little connection was found between this variable and the variance (statistical) of the samples. The experimental result which was observed can be explained on the basis that the ash in coal is to be found in patches of varying ash content, and that the patches are distributed in an irregular manner. From this it has been suggested that the most satisfactory way to sample regular deliveries in coal would be to measure the accuracy of sampling as sampling proceeded.

In essence this method involves the use of quality control, with two gróss samples taken on each occasion instead of one. The two samples, made from separately taken increments, are separately analysed, giving two values for ash content. Since each value is equally valid, the difference between them is an estimate of the accuracy of sampling, reduction and analysis. When some 10 to 12 pairs of results are to hand (as from successive deliveries of the same coal) it will be possible to calculate this accuracy with confidence.

Specification

In a tentative specification of duplicate sampling, the appropriate B.S.I. sub-committee has suggested that the uncertainty of individual determinations should be about 10% of the variation shown by the coal over a period of time. Results obtained will show if the coal is being over- or under-sampled. A modified form of multiple sampling might also prove worth while.

NOTES ON WIRING *by Megohm*

Simplicity and Safety

I HEAR that the I.E.E. Regulations for the Electrical Equipment of Buildings (12th edition) are likely to be revised in the near future and the Wiring Regulations Committee are seeking instructive comments so that these may be incorporated in a new edition.

I venture to suggest the important point in connection with any set of regulations is to see they are compiled so that the intentions of such regulations can be easily understood, and are directed to ensure safety to the user.

There is evidence that some of the present Regulations have not been fully understood, which has been illustrated by publication of the Wiring Regulation Committee's replies to enquiries raised on the regulations. The publication of the A.S.E.E. Guide to the I.E.E. Wiring Regulations to assist electricians and others to follow the intentions of certain Regulations by diagrams and re-wording adds weight to the suggestion that they can be improved by simplification.

I believe everyone will agree the primary intention of any set of regulations is to ensure that they are framed to direct attention to dangers arising from mis-use. The reporting of electrical accidents in the Press from time to time focuses attention on the fact that there is something wrong when such accidents continue to occur and may be to some extent a condemnation of some of the directions given in the Wiring Regulations.

Safety for Consumers

Problems concerning safety to the user have been explored and discussed over and over again. To earth or not to earth, to protect by fuses, rewirable and h.r.c. or circuit-breakers and earth leakage trips all have points in their favour but at some time, somewhere, they have been found wanting. Maybe a high resistance joint in the conduit system, a broken earth continuity conductor, a sticky circuit-breaker, a defect in the earth leakage system, exposed live metal work, over-rated fuses and circuit-breaker settings, or some other peculiar fault develops resulting in a serious accident and consequent bad publicity for the electrical industry. Why not face the problem now and admit a pressure of 240 V a.c. is not entirely a satisfactory potential for use in homes where many portable electrical appliances are in daily use under all sorts of conditions?

Correspondents from overseas tell us they have not heard of electrical accidents as reported in this country even in semi-tropical and tropical countries where conditions are generally far worse than here. Natives who work bare-footed and whose skins are moist due to climatic conditions and are, therefore, more susceptible to electric shock, also appear to be immune from serious accidents under these conditions, which supports the contention that a reduced potential lessens shock risk.

Overseas Experience

The United States and overseas countries recognise that the introduction into domestic premises of voltages in excess of 110 V is not satisfactory and we also should do likewise since there is little doubt that the positive remedy for reducing electrical accidents in the home is to reduce the potential. True service to the general public will be given by stressing the importance of this approach to safety in any revision made to the present Regulations.

The British Electricity Authority and the Factory Dept. Electrical Branch strongly recommend that a reduced potential is used for energising portable appliances and lamps in industrial premises, and further in Code of Practice documents it is stated a voltage not exceeding 55 V to earth should be used for energising portable appliances to ensure safety.

Opposition may be raised to reducing the operating voltage in domestic premises on the grounds of cost, but since there is no other more positive way of securing safety, the sooner the changeover from 240 V a.c. to 110 V a.c. is made the better for public safety.

The standardisation of services at 110 V a.c. should not add considerably to the cost of internal wiring installations for residential premises providing the present ratings for v.i.r. cable and socket outlets, which are quite capable of carrying greater loads, are suitably uprated. The adoption of services at 110 V should also be of some help to our manufacturers who are seeking overseas markets for their electrical products.

DRYING on the Farm

Opportunities for Electrification are increasing as Food Prices Rise

MECHANISATION is on the increase in farming, as in most industries. One aspect of this trend is the move towards using artificial methods of drying crops, and since this involves static apparatus in and about the farmyard, it is potentially a suitable application for electrification. How far this is realisable in practice is considered in a paper, "Electricity in Farm Crop-Drying," by C. A. CAMERON BROWN, B.SC., M.I.E.E. (B.E.A.) and P. G. FINN-KELCEY, A.M.I.E.E. (E.R.A.), which the latter read before the I.E.E. Utilisation Section last Thursday.

Grass and Hay

Herbage crops are usually required on the farm for the feeding of stock during the winter months. Usually the moisture content on cutting is high, 60-75% in the case of hay, from which it must be reduced to about 20% for safe storage in bulk. In the case of dried grass the initial content of 70-85% must be reduced to 7% or less for grinding into meal. Usually it is impracticable to use electric heat for removing such large amounts of water, but it may be acceptable to use it for increasing the value of the product, especially as good hay now has a value of some £15/ton, and the cost of electricity has risen less compared with pre-war prices than most of the products of its use.

Barn drying of hay may be performed electrically by allowing the hay to dry to 40-45% moisture content in the field, and then spreading it on an open flooring system and blowing cold air through it. A fan and motor of some 3½ h.p. are required, together with floor ducting. Under ideal conditions a drying cost of 6s. 6d./ton of finished hay may be expected, with up to £1 under bad conditions.

Grain Drying

Grain drying is necessary as a corollary to the use of the combined harvester-thresher. For safe and prolonged storage in bulk, the moisture content of wheat should not exceed 14%, and in sacks 16%, while for barley the corresponding figures are 13% and 15%. Farm drying enables the farmer to store his wheat and gain the benefit of higher prices. The moisture reductions in grain drying are comparatively modest, and this makes the application of electricity for heating a practicable proposition.

Direct grain driers are the simplest form of appliance, but in the electrical form they are in many ways out of date. They use 30 kWh for each ton of grain reduced in moisture by 1%, giving a total drying cost of 8s.-10s. with electricity compared with 2s. with coke. More promising are bin driers, which are about 10 ft high and 13 ft in diameter and have a porous floor, generally of foamed slag block. Air at a temperature of 10-15° F above ambient is blown through the plenum chamber below the bins, and blowing continued for some weeks.

In most cases a 15 kW heating installation together with a 4-10 h.p. fan motor is sufficient, together with other motors (3-10 h.p.) for conveyor gear. Consumption is 13 to 22 kWh/ton dried per 1% reduction in moisture content. Main drying is likely to be over by September or early October, so the load is attractive electrically.

Platform Drier

When grain is handled in sacks, a platform drier is appropriate. This has a plenum flooring with open grills on which sacks of somewhat larger size than the openings are placed. A 40-hole platform, accommodating two tons of grain, requires a 4 h.p. fan. Although oil-firing was the original intention, electric heating has been found satisfactory, with the additional advantages that there are no fumes. Direct substitution of electric heating means a load of 45-50 kW, but the consumption of fan and heater may be as low as 25 kWh/ton/1% moisture content reduction. Drying at a lower rate of extraction may decrease this demand still further.

An added advantage of the platform drier is its versatility in dealing with a number of farm drying tasks.

In the opinion of the authors, if 10% of the hay crop of Great Britain were treated by

cold blowing, finishing with heat, consumption would reach 600 m. kWh/year, with a connected load of 1,000 MW, much of it at night only. One third of the grain crop dried would consume 150m kWh yearly. Electrical methods should be particularly attractive on the smaller farms.

It is essential, however, that the electricity industry should decide if it really wants the loads concerned. They are likely to have to be fought for against competing interests. In particular, the supply side will have to consider its tariffs and the manufacturing side the form and range of equipment made available. Tariffs must take account of the fact that much farm crop-drying is done outside of peak load months, and that it lends itself to off-peak restriction and even to night running only. Finally—and most important—sales and development staff must speak the farmer's language.

DISCUSSION

MR. J. I. BERNARD (E.D.A.) thought there was no doubt that the crop drying load deserved development and greater attention. The physical phenomena of drying were most interesting, because there was no real basis of efficency in the normal sense.

MR. F. E. ROWLAND (G.E.C.) gave it as his opinion that the drying and storage of grain crops is likely to be one of the most important developments in farming in the next few years. He found himself in general agreement with most of the paper. Oil was a competitor of electricity for farm drying, but he thought it safer to rely on a home fuel for food production. He thought that more promotional activity could make barn hay drying more widespread in this country. It was particularly encouraging to find that multi-purpose driers were being considered, and he joined with the authors in appealing for special tariffs for such applications.

MR. J. HAWKINS, speaking as a hop farmer, had no doubt that there was a big market for electrical equipment in the agricultural industry. It was essential, however, that plant should be cheap in installation, maintenance and running and simple to operate. Electricity gained from the last point. The spreading of electrical ideas, however, must not be left to agriculturists.

DR. L. HARTSHORN (N.P.L.) expressed the conviction that where the main feature was not the actual production of heat, but rather applying it at the right time and under the right conditions, then electrical heating has unique advantages.

MR. H. J. GIBSON (M.E.B.) considered it essential that staff who dealt with farmers should speak their language. Electricity boards were very much alive to the importance of the rural load, and they were trying to recruit and train suitable men. On the subject of tariffs, he suggested that as most farm tariffs were essentially two-part, the extra price of electricity for drying was effectively already being fixed at a cheap rate because other, preferred, farm uses absorbed the fixed charge. The average cost of farm electricity was only about one penny/unit.

So far as design of plant was concerned, he wished to see more use of the contra-flow principle. Multi-purpose drying plants were proving successful in some cases in his experience.

MR. D. F. LOTT described cases where grain had been dried in an existing building on temporary ducted floors. Suction type conveyors were valuable as an aid to drying and handling grain in bulk.

MR. W. COVER suggested that in most cases boards had realised that the farm drying load was off-peak, and in many cases was completely disconnected in winter. The running charge component of tariff should be acceptable if it was not loaded with a kW component. He believed that the industry was on the threshold of an all-purpose drier.

MR. G. C. KIM referred to the drying of grain in central establishments which dealt with up to 12,000 tons during the harvest period. He suggested that the load, which might be as high as 1,300 kW, might be somewhat unwieldy in remote country districts.

MR. E. C. CLAYDON (S.E.E.B.) claimed successful electrical drying of grass without pre-wilting. At the high prices obtainable for the product, even if the drying costs approached £10/ton, the advantages of the method would justify its use. In Sussex, using the platform drier, it was possible to go as low as 12 kWh/ton/1% moisture reduction, and with such low figures the cost of electricity for heating was unimportant.

He felt that the incidence of the maximum demand charge could be varied at the discretion of the Board involved, and could safely be made a very low figure for good farming loads.

Amongst other speakers was MR. S. F. OSBORNE (S.E.E.B.), who read out an advertisement for agricultural development engineers for an electricity board at a salary of £480 per annum. That salary, he suggested, was a measure of the enthusiasm with which the boards were pursuing the development of the use of electricity in agriculture.

The Author, in reply to the discussion, said that on a three-man farm the man-hours required for the electric drying of grass in a hay drier were lower than for traditional haymaking, and the quality of the product was very much higher. The farming community would be satisfied with a flat tariff of 1½d. a unit throughout the year, apart from the four winter months, with no installed or maximum demand charges. A grain drier in the Eastern Counties was a form of insurance against a wet season, and the farmer should not be penalised if he used it only for a few odd tons of grain. nfra-red drying had not been used for crop drying; infra-red lamps were not always successful in dusty atmospheres and were likely to use more electricity than resistance-type air heaters. With an all-purpose drier the load factor in the summer months should be almost 100 per cent.

CLEAR COOKERY LESSONS ON T.V.

The oven has been featured in two programmes to date but it is expected that it will be used many more times by the T.V. Cookery experts Miss Marguerite Patten and Mr. Philip Harben. On the right is the cooker shown close-up above being used during an actual television demonstration

Making a recent television debut at Alexandra Palace was this specially built electric cooker, made by Jackson Electric Stove Co. Ltd. The oven has a glass back and sides to enable the studio lighting to illuminate the interior, thus permitting viewers to see food actually cooking

Rural Electrification in Asia

AMONGST the activities of Unesco's Economic Commission for Asia and the Far East is the development of that region's electric power supply. Recently attention has been directed to the problems of rural electrification, and in Bangkok last month a 16-nation conference considered future steps in this field.

A study prepared by the Unesco secretariat for consideration by the conference notes that except in the case of Japan and China (Taiwan), progress so far achieved is insignificant. In emphasising the task that exists, the report notes that more than 80% of the population of the region lives in rural areas.

Outstanding as an exception to the general rule of a low standard of rural electrical development in the region is Japan, and it was noted by the Conference that no less than 97.5% of all the villages and towns of that country had been electrified. It was suggested that experts of Asian countries planning rural electrification would greatly benefit from a study of the methods that had been employed.

Subsidies

There was general agreement at the conference that any large increase in rural electrification could only result if governments were ready to facilitate the financing of appropriate programmes. As a first step it was suggested that one or more villages in each country should be selected for electrification from either a local generating station or from a neighbouring urban supply. In these villages, power would be applied to every economic use that would contribute to the welfare of the people concerned.

A demonstration project of this nature is planned for Pakistan, and financial aid for the project is to be sought from the U.N. Technical Assistance Administration.

Technical considerations that would affect the pattern of rural electrification were discussed at some length, with particular reference to the availability of materials. It was held by a majority of the delegates that 11 kV might well be used as a basic voltage for rural schemes, as equipment at this voltage was comparatively easily obtainable.

Although isolated systems are likely to make use of diesel generating sets, the chances of steam generation are increased by the considerable lignite resources which are believed to be available in the region. Little has previously been done to develop these, and there was a call for additional technical information on all aspects of lignite mining and utilisation.

PROBLEMS AND PRACTICE in Engineering

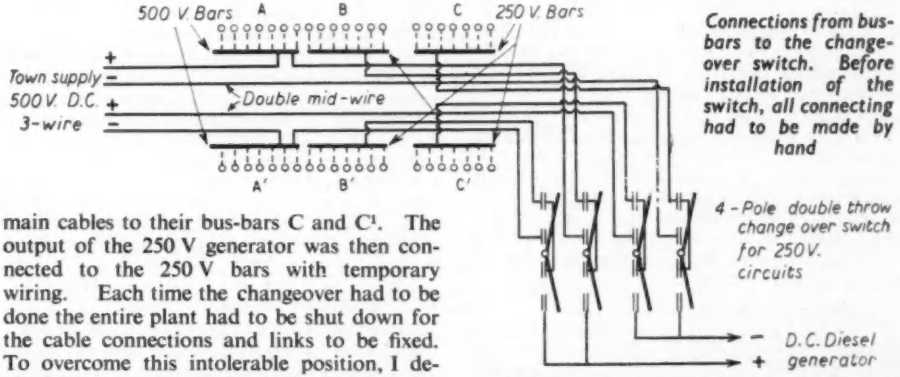
Standby Supply

IN 1947-48, when the supply authorities requested their larger consumers to cut their m.d. during peak load hours, I was asked to install a temporary diesel generator for this purpose. The set to be used was a 2-wire 250 V d.c. machine and the supply given to the factory was 500 V d.c. 3-wire.

When the supply was first installed in 1904, 500 V 3-pole switches were hardly obtainable and not of good design. Presumably for these reasons the installation was designed as a 4-wire job, each d.p. main switch controlling 250 V only, breaking the line main and one of the two mid-wires. In the original installation, two 500 V distribution bus-bars were used to supply seven 500 V circuits and, in conjunction with two mid-wire bus-bars, fourteen 250 V circuits.

Later this installation was modified to take a standby supply from the 250 V machine mentioned previously, leaving the 500 V circuits still on town supply. The main 500 V bus-bars were cut into two parts, A and B (see diagram) separating the 500 V circuits from the 250 V circuits, and when the town supply was used for the entire installation, the two parts were connected by a link.

Changeover to the standby supply necessitated breaking this link, and also the mid-wire main cables to their bus-bars C and C¹. The output of the 250 V generator was then connected to the 250 V bars with temporary wiring. Each time the changeover had to be done the entire plant had to be shut down for the cable connections and links to be fixed. To overcome this intolerable position, I devised the arrangement shown in the diagram, making all cable connections permanent. The choice of either source of supply was simply determined by the throw of a switch made specially for me and the job.—*C. O. S.*



Connections from bus-bars to the change-over switch. Before installation of the switch, all connecting had to be made by hand

Bad Earthing

WHILST making routine inspections of portable electric tools, I examined a ½-in. drill and found the earth conductor of the 3-core flexible to be open-circuited. At the point where connection was made to the body of the drill, the conductor was burnt through, apparently by a heavy current, and was discoloured along its whole length and the rubber insulation softened and burnt. An insulation test of the drill gave a resistance value of 20 megohms. The other two cores of the flexible appeared normal and showed no signs of overheating.

The problem was: how did the heavy current flow originate? I then remembered having seen the drill in use near an all-metal bench in the electric welding bay. Inquiry showed that the welding transformer (portable) had been used with the earthing clamp merely laid on the bench instead of screwed on. Whilst work was in progress the drill had been laid on the table with the plug still in the supply socket. A proportion of the welding current had then flowed into the drill body, and via the earth conductor and switch/socket into the general earthing system, then through the earth conductor of the supply lead to the welding transformer and so to the "earthed" or return side of the secondary winding.—*H. A. B.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Problems of a practical nature to which a solution is required will also be considered. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication.

overseas news

H.P. With Ease?

The latest idea in Canadian electrical appliance merchandising is the use of the "budget meter" or "bank-a-day purchase plan." In one version of the plan, the customer buys a cooker, refrigerator or washing machine with no down payment (though a careful check into his credit rating is made!). Installed inconspicuously on the delivered appliance is an 8 in. by 10 in. meter. Into this glorified "piggy bank" the housewife pays the price of her new appliance by depositing 50c. daily. Company collectors call weekly for the $3.50. The second version avoids collection costs, but may not be as much help to the customer. Here, the bank is simply used as a saving device. The housewife empties it herself at the end of each month and goes to her dealer to pay the instalment.

Delay on St. Lawrence Power?

December 9 is the date fixed by the U.S. Federal Power Commission to hear the application for nominating the New York State Power Authority (or some other body) to act with the Hydro Electric Power Commission of Ontario in the St. Lawrence River joint power development. Although in Canada it is hoped than an early decision will be given, a sobering warning has been given by the Great Lakes-St. Lawrence Association. The Association believes that it will be at least two years—it could be much longer—before the final all clear is given for a start on the project, because there are still many obstacles yet to be cleared by the U.S.

Adequate Wiring

"Electrical contractors are jamming up the bright, new household appliances with their long whiskers." That is the complaint of the Canadian Electrical Appliance Industry. With the leaders of that industry intent on selling more of a host of new items to make up for near-saturation of markets for many standard appliances, they have decided to introduce "a College course for contractors." For the manufacturers believe that contractors should aim to install wiring which will be able to cater for the heavier loading brought about by the use of more appliances. The lectures are being organised by the Canadian Adequate Wiring Bureau, in Toronto.

Poland's Brown Coal

Like other countries, Poland too is turning to the utilisation of brown coal deposits for the generation of electricity. In the Konin region large deposits are known to exist and opencast mining has just started. Next year, work will commence on the construction of a power station of high capacity, the boilers of which will burn brown coal. In addition factories are to be erected for processing the coal into semi-finished products.

Austria's Problem

An international conference on the development of hydro-electric power is likely to be held early next month at Innsbruck, in the Austrian Tyrol. From reports it seems that the plans of the Minister of Finance, Dr. Reinhard Kamitz, to obtain financial aid from abroad to turn Austria into a major generating area, are nearing completion. It is understood that delegates from Italy, Switzerland, Western Germany and Austria will attend the conference.

A Power Board?

In Israel a five-member Power Board is to be set up, we learn, which will act as a central authority on all matters concerning electricity supply, rather after the style of our former Electricity Commissioners. The name of Mr. L. Vilentshuk, President of the Engineers Association, has been mentioned as leader of the Board. The Board will deal with all questions of prices, concessions to companies and planning. Two Board members will represent the Finance Ministry and another two the Ministry of Commerce and Industry.

Volta River Project

Agreement has been reached in principle for the carrying out of development of the Volta River project for hydro-electric power and the production of aluminium, we learn. A Government White Paper giving full details was published late on Tuesday. It is proposed that the British and Gold Coast Governments should be responsible for the hydro-electric scheme, while the British Aluminium Co. Ltd., and Aluminium Ltd., of Montreal, would be responsible, through a subsidiary for the mining of bauxite and the erection and operation of plant for the extraction of aluminium. Earlier reports envisaged an output of 500 MW, and 200,000 tons of ingot aluminium a year.

Uganda Needs Funds

The Government of Uganda is concerned at the difficulty of obtaining sufficient cash to finance work during the next two years on the Owen Falls hydro-electric scheme and the extension of the railway westwards. This has been revealed by Mr. C. Spenser, Finance Secretary, when moving the draft estimates of Uganda's expenditure for 1953. He explained that the Government was at

present denied access to the London loan market and would probably be unable to obtain a further instalment of the approved loan of £13 million for the Uganda Electricity Board until June, 1954.

Review at Karachi

At Karachi, with an anticipated 5,000 kW increase in generating capacity this month, the Priorities Allocation Committee has considered all applications from potential consumers. The committee has approved, with certain modifications, about 400 applications from industrial concerns, and a further 7,000 for domestic and commercial purposes.

Avoiding Internal Combustion

Spontaneous combustion tendencies of Collie coal under long-term storage conditions have been overcome by the State Electricity Commission of Western Australia at the South Fremantle power station. The special measures taken to achieve this were explained to the Perth division of the Institution of Engineers in a paper presented recently by the general manager of the Commission, Mr. F. C. Edmondson, and the engineer in charge of the drawing office, Mr. C. G. Carter. To counter the fire danger the coal store is enclosed by a 10 ft. high retaining wall which denies winds access to the sides of the stockpile. The coal, being stacked by bulldozer, is thoroughly compacted and this, with the protection of the sides, effectively prevents air circulation in the interior of the pile and inhibits the outbreak of fire. At intervals, vertical pipes lead to the interior of the stockpile into which thermometers may be lowered for temperature observation.

Import Licence Refused

A. Reyrolle and Co. have lost an order worth nearly £109,000 because the Australian Government has refused to grant an import licence to the Sydney County Council. The Council was proposing to give Reyrolle's the order for 150 sets of metal-clad switchgear for substations. But not having an import licence it has now been decided to divide the order between Australian General Electric Ltd., and another local concern, although this will mean an additional £50,000 in the costs.

Development Retarded

The State Electricity Commission of Queensland in the past year was able to borrow a record £3,410,000 for regional power stations and other development projects. This was a substantially larger sum than financial houses and the public ever previously loaned the Commission in one year. The money financed urgently needed extensions of electricity supply, and the work will be carried a step further forward with subscriptions to the current £750,000 public loan. In his annual report tabled in Parliament recently, the Commissioner, Mr. Neil Smith, pointed out that the loan funds available for regional board areas in 1951-52 were only sufficient for completion of major generating facilities to fully protect supply to existing consumers. The overall shortage of funds in Australia had set back by many years the time when the large number of people still waiting for electricity would receive it, he said. An expenditure of £9,069,600 had been approved of the programme, but this would depend almost entirely on the capacity of the loan market to provide the funds.

Electrification Progress

Re-survey work for Brisbane suburban railway electrification was now nearing completion, the Railways Commissioner, Mr. Moriarty, stated in his annual report tabled in Parliament a few days ago. Designs of nearly all station yards had been planned and the tracks to be electrified were being chosen. Sites of practically all substations and tie-stations had also been determined. Construction of refuge sidings at several stations was continued during the year, and the raising and extending of platforms had progressed considerably. Replacement of 60-lb. rails by 94-lb. rails (specially for electrification) had begun on the Sandgate line between Nudgee and Sandgate. The report also revealed a railways deficit of £3,392,278—£1,900,075 more than last year. Earnings were the highest ever recorded—£22,523,110.

Priority Needed

British manufacturers would not accept orders from New Zealand electricity supply authorities unless they knew that sterling funds were available, stated Mr. C. J. Lovegrove, president of the N.Z. Electrical Supply Authorities Association, at the annual conference, recently. He urged that these electricity undertakings be given the highest priority in obtaining overseas funds and loan money to buy equipment. The conference approved a proposal to approach the Minister of Finance about the matter immediately.

Geothermic Power for Japan?

Power generation by geothermic steam is to be widely used in Japan, according to the Industrial Science and Technology Board. Construction of the first such power plant is shortly to be started in Oita Prefecture by the Kyushu Power Co., with technical and financial assistance from the government. The power plant construction was based on co-ordinated study by the I.S.T.B., the Geological Research Laboratory, the Electric Power Experimental Station and other public technical institutes during the past six years. Hope for success of the development came last autumn when the research team working in Beppu succeeded in generating 30 kW continuously by using volcanic steam pressure. The projected power plant would generate 3,000 kW in the initial stages of operation, but the capacity would ultimately be increased to 150,000 kW. According to a survey by the I.S.T.B., there are about 40 volcanic places in the country where such power generation is possible.

PERSONALITIES

IN THE INDUSTRY

Chosen for the post of station superintendent at the new Carmarthen Bay power station, South Wales Division of the B.E.A., is **Mr. B. S. Gylee,** B.SC.(Eng.), A.M.I.Mech.E., A.M.I.E.E., who, since 1949 has occupied a similar position at the Division's Tir John generating station. Mr. Gylee went to Tir John in 1945 as boiler-house superintendent, and in 1948 became resident engineer. Earlier he had been assistant power station superintendent at Lydney (Glos) power station, following experience at the Hayle generating station of the former Cornwall Electric Power Co. Mr. Gylee was joint author with Mr. E. Hywel Jones of a paper presented at the 1947 Harrogate conference on Pulverised Fuel. He has been chairman of the West Wales section of the E.P.E.A., and was chairman of the West Wales sub-centre of the I.E.E. in 1949-50. Mr. Gylee takes up his new duties on December 1.

Mr. B. S. Gylee

Siemens Electric Lamps & Supplies Ltd. announce new appointments to the board. **Dr. J. N. Aldington,** B.SC., Ph.D., A.M.I.E.E., director of Research at Siemens' Research Laboratories, Preston, has been appointed managing director, with **Mr. H. E. Humphries,** M.B.E. (managing director of Siemens Brothers and Co. Ltd.), as chairman. Dr. Aldington, who has been with the company for over 30 years and joined the board in 1948, has held the office of President of the Illuminating Engineering Society, and his many important contributions to technical publications in this country and his lectures covering every aspect of the lighting field are well known. **Mr. C. J. N. Borg,** general manager, **Mr. C. A. Hughes,** A.M.I.E.E., sales manager, and **Mr. P. D. Oakley,** B.SC., manager of the Preston lamp factories, have also joined the board of the company. Mr. Borg joined the firm in 1934 as assistant secretary, becoming secretary and later general manager on the retirement of Mr. S. H. Callow. Mr. Hughes entered Siemens' service in 1910, becoming manager of the Lamp Department in 1924, and sales manager in 1940. He was chairman of E.L.M.A. in 1949/50 and 1950/51. Mr. Oakley has been with the company since 1915, moving from Dalston in 1923 with the transference of the Lamp Works to Preston, where he has since remained, taking charge of the lamp factories there in 1939.

Mr. H. G. Carter, A.C.A., secretary of Lancashire Dynamo Holdings Ltd., has now been appointed to the board.

Mr. R. H. Lancaster has resigned from his position of sales manager to Nash-Kelvinator Ltd. to accept a post on the Board of their London distributors, Coldstor Ltd. and subsidiary Self-Service Refrigeration Ltd. He commences his new duties as sales director of Coldstor Ltd. on December 1.

The University of Manchester has established a Chair of Mechanical Engineering in the faculty of science in addition to the Beyer Chair (founded 1868) and the Chair of Electro-Technics (1912). There are also in the faculty of technology, which was started in 1905, chairs in both mechanical and electrical engineering. **Mr. J. Diamond,** B.SC., M.SC., A.M.I.Mech.E., has been appointed to the new chair. In 1944 he became a senior scientific officer in the British atomic energy team at Montreal, and since 1946 he has been at the atomic energy research establishment at Harwell.

Secretary to the late Lord Hirst, **Miss E. C. Bradshaw** has retired from the General Electric Co., Ltd., after 40 years' service. On the death of Lord Hirst, Miss Bradshaw became secretary to Mr. H. C. Wilson, secretary of the G.E.C. Pension Fund.

Dr. J. N. Aldington

Mr. C. J. N. Borg

Mr. C. A. Hughes

Mr. P. D. Oakley

Dr. C. F. Bareford, M.Sc., Ph.D., manager and head of the Mullard Electronics Research Laboratory, since 1946, has been chosen to succeed **Mr. H. C. Pritchard,** as chief superintendent of the Long-range Weapons Establishment at Salisbury and Woomera, Australia, we learn. Mr. Pritchard is returning to the Ministry in Britain, next year. Dr. Bareford gained his Ph.D. degree for work on spark discharges, and in 1934 joined the British Thomson-Houston Co., as a vacuum physicist, dealing with the design of radio valves and other electronic devices. Between 1936 and 1946 he was with the Admiralty Signal Establishment, engaged in research and development work connected with radio location, telecommunications, etc.

Dr. C. F. Bareford

The retirement of **Sir William Robinson** from his position as chairman of the Electricity Board of Northern Ireland has been announced by Mr. W. V. McCleery, the Northern Ireland Minister of Commerce. Sir William is retiring owing to pressure of business. Mr. McCleery said it was intended to appoint as new chairman, from January 1, **Mr. James Walker,** F.C.A., who has been a member of the board since 1947. Sir William became a member of the Electricity Board in 1942 and has been chairman since 1944.

On December 16 next the president of the British Association for Commercial and Industrial Education (B.A.C.I.E.), **Sir Edward Crowe,** K.C.M.G., will be handing over the presidency to **Sir Arthur P. M. Fleming,** C.B.E., D.Eng., M.I.E.E., director of research and education to Associated Electrical Industries Ltd. and a director of Metropolitan-Vickers Electrical Co., Ltd.

Mr. J. R. Tole has been appointed manager of the British Thomson-Houston Co.'s engineering drawing offices in the Rugby and the Coventry works organisation. Mr. Tole became a draughtsman after an apprenticeship with the company commenced in 1921. He succeeds **Mr. P. E. Warden,** who is retiring after 50 years' service with B.T.H. Mr. Warden also joined the company as an apprentice, in 1902. He has been manager of the company's drawing offices since 1945.

Mr. J. R. Tole

Siemens Brothers and Co. announce that **Mr. W. G. Patterson,** M.B.E., M.I.I.A., who has been with the company for 35 years, has joined the board and has been appointed deputy managing director.

Mr. W. G. Patterson

E. K. Cole, Ltd., have appointed **Mr. W. A. Connor** as their representative in the West Lancs area, which includes Liverpool. Mr. Connor joined Ekco from Aldridges (Music) Ltd., of Southport, where he has been manager and radio and television buyer since 1945.

Mr. A. C. L. Fooks has been nominated project engineer for the Wairakei geothermal power development of the New Zealand State Hydro-Electric Department.

OBITUARY

Major V. B. D. Cooper, O.B.E., R.E., M.Inst.C.E., M.I.E.E., who died on November 17, aged 94, was responsible, as chief engineer, for the construction of a number of the early municipal electric tramway and railway systems and the lighting by electricity of towns, including the Smithfield area in the City of London. Among the tramway systems with which he was associated were those at Yorkshire (West Riding), Douglas (I.O.M.), Ilkeston, Stoke, Hanley and Dover. He also conducted negotiations incident to the presentation of about 40 Bills to Parliament, the Board of Trade, and the Light Railway Commissioners, and obtained many of the Electric Railway Powers of the Middlesex and Hertfordshire County Councils.

Mr. W. H. Ayres, governing director of Refrigeration Service Ltd., Ashton-under-Lyne, died on November 20.

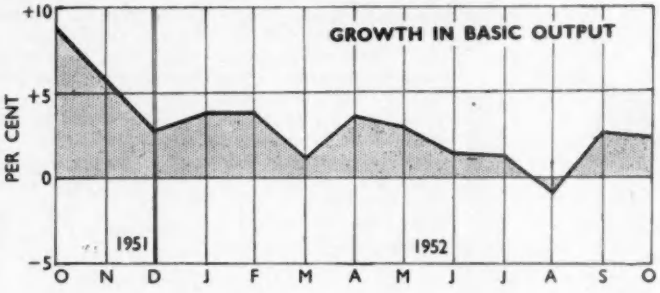
Mr. E. E. Putland, A.M.I.E.E., of Petts Wood, died on November 17, aged 88.

Mr. T. T. Cameron, A.M.I.E.E., senior assistant (operation and maintenance) with the South West Scotland Electricity Board, died on November 18, aged 54. He started with the Glasgow Corporation Electricity Department in 1925, but transferred to the Clyde Valley Electrical Power Co. as assistant district engineer in 1929, and eventually served on the staff of the chief engineer.

Mr. S. R. Roget, B.A., A.M.I.E.E., of the British Standards Institution, died on November 17, aged 77. He joined the B.S.I. in 1941, being engaged on revision of Standards. He acted as secretary to 31 committees and for a man of his age, displayed a remarkable agility of mind. The grandson of Dr. P. M. Roget, the author of the famous "Thesaurus," he had for many years kept the work up to date.

BASIC LOAD GROWTH

The accompanying curve shows how the energy sold by the B.E.A. in the past 12 months has compared with that of the corresponding month a year earlier. The figures used for plotting are first corrected for the effects of temperature and for the number of working days included in the calendar month. Thus the points marked are an approximate measure of the basic rate of load growth being experienced by the B.E.A.



Power Supply in October

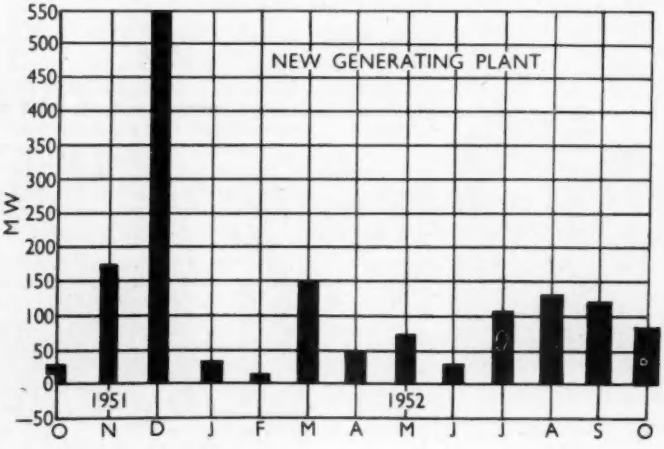
ALTHOUGH the installed capacity of the B.E.A. increased during October by only 79 MW according to Ministry of Fuel and Power figures, the Authority's records tell a more imposing story. Sets with a total rating of 155 MW were commissioned, together with boilers having a total evaporative capacity of 1,840 klb/hr.

The one new station in the list is Uskmouth, where the first 360 klb/hr Babcock & Wilcox boiler was commissioned. An initial capacity of 360 MW is planned for this South Wales Div. station, with the same total for the similar B station. Sets are to be 60 MW G.E.C. machines, with 900 lb/sq in., 900° F steam conditions. Another station still without turbo-alternators running is Bankside (London Div.) at which a second 375 klb/hr Foster-Wheeler boiler came into use.

Barking C (London) tells the opposite story, for the second 75 MW B.T.H. set installed here draws its steam (900 lb/sq in., 900° F) from the earlier station. Two more London stations figure in the list, Deptford East with a 250 klb/hr boiler as part of extensions, and West Ham B with the final (fourth) 30 MW English Electric set of its present stage of extension. Two boilers only are now outstanding here.

In the South Eastern Division, at Croydon B, the seventh of eight intended 320 klb/hr Simon-Carves boilers was commissioned. Bromborough (Merseyside and N.W. Div.) noted the commissioning of a third 50 MW English Electric set. Machines at this latter station have hydrogen cooling.

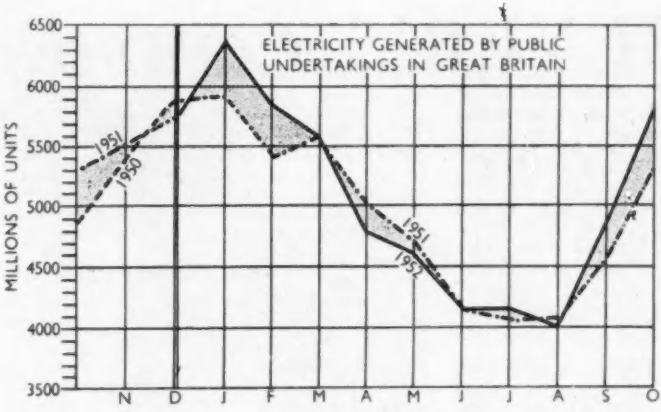
The list is completed by two boilers. First, a 175 klb/hr Simon-Carves unit as part of extensions at Northampton (East Midlands



GENERATING PLANT

At the end of October, 1952, the installed capacity of the B.E.A. was 16,435 MW, showing an increase of 79 MW during the month. During this same period the North of Scotland total remained constant at 643 MW. The month's commissioning figures bring the overall increase during the past twelve months to 1,471 MW, or 9·4% of the total at the end of October, 1951.

The total installed capacity used for the purposes of this graph is the total m.c.r. of all the generating sets which are connected on both steam (if appropriate) and electric sides and are suitable for service.



UNITS GENERATED

5,558 million units was the total generated during October in stations under the control of the B.E.A., the North of Scotland H.E. Board, and the Lochaber Power Co. The corresponding figure last year was 5,289 million units.

Of the total, 5,403 million units was generated in steam stations and 142 million units in hydro-electric.

Energy sent out during the month was 5,239 million units, 94·3% of that generated. This gives the total for the year so far as 46,961 million units, showing an increase of 2·2% on the same period of 1951

Div.), where 30 MW sets are to be installed, and finally one of 360 klb/hr rating at Skelton Grange (Leeds-Yorkshire Div.). International Combustion are the manufacturers here.

Units Sold

Generation during the month consumed 3·06 million tons of coal and 5,500 tons of oil, an increase of 1·1% and a decrease of 8·3% respectively on October, 1951. Although the total energy generated showed a 5·1% increase on the same basis, this is partly accounted for by the colder weather experienced during October this year. Comparable temperatures are 52·1° F and 50·1° F.

B.E.A. SALES TO AREA BOARDS IN OCTOBER

Board	Oct. total in million units	% inc. or dec. on Oct., 1951
London	484·9	+4·8
South Eastern ...	273·1	+4·4
Southern	325·4	+8·3
South Western ...	154·9	+8·1
Eastern	453·8	+5·7
East Midlands ...	394·3	+6·1
Midlands	538·4	+5·4
South Wales	286·0	+2·9
Merseyside and N.W.	289·8	—3·0
Yorkshire	524·7	+8·8
North Eastern ...	313·5	+1·0
North Western ...	564·0	—0·8
S.E. Scotland ...	109·4	+8·2
S.W. Scotland ...	268·3	+8·0
Direct Sales	62·9	+5·9
Grand total ...	5,043·4	+4·5

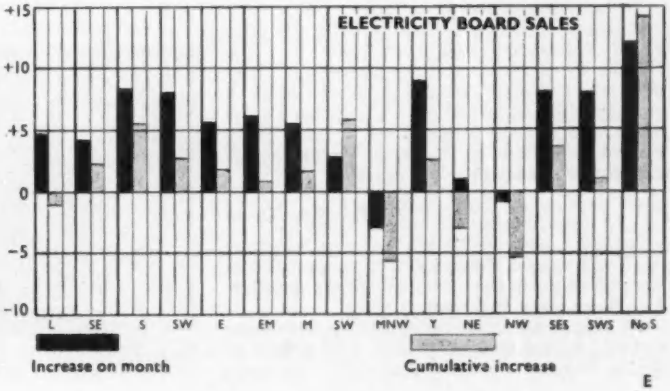
Provisional figures for sales by the B.E.A. show that when the 4·5% increase over 1951 is adjusted for normal weather and a standard number of working days, it falls to an equivalent of 2·4%. The cumulative increase on the financial year so far (7 months) is 2·0%, as against an absolute value of 0·4%.

Generation in the north of Scotland showed an increase of 12% on October of 1951, with a far higher proportion of hydro-energy to steam than last year. Cumulative figures for this board are well up on those for most B.E.A. areas, that based on units sent out being 14·1% up to the end of October for the financial year, which runs from January 1.

SALES IN OCTOBER

Progress in the sales of electricity of the British Electricity area boards and the North of Scotland H.E. Board are represented in the accompanying diagram. The two columns for each board indicate, respectively, the bulk supply of electricity taken in October, 1952 as a percentage increase on the corresponding 1951 figure, and the same comparison for the cumulative totals based on the financial year.

It should be noted that the B.E.A. financial year runs from April 1, and that of the N. of S. H.E. Board from January 1



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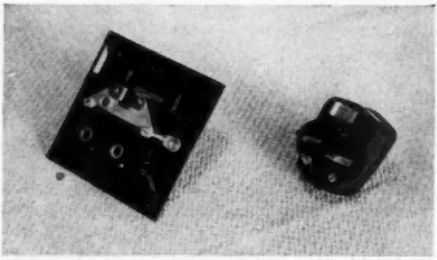
The BUYER'S *Column*

New Becker Accessories

THE new 13-amp fused plug and shuttered socket outlet, just introduced by GEO. BECKER, LTD., Ampere Works, Northend Road, Wembley Park, complies completely with the relevant British Standard Specification (B.S. 1363 : 1947), yet it has a number of useful design points which are claimed to be in advance of this specification. The first of these is that the shuttering "fails safe." The Becker socket outlet shutter drops down automatically by gravity, even if the spring should fail for any reason.

The two mouldings forming the base and the front plate of the socket outlet are positively lined up by two dowels mou'ded into the base, rather than being pulled into place by the fixing screws only. Another refinement is that in the plug itself provision is made for a spare fuse.

The terminals and those in the plug are easily accessible for wiring up. A final saving of time on installation is given by securing both mounting screws to the front plate of the socket by means of a small fibre strip. The screws will, therefore, not be mislaid or lost but can be removed for use in a matter of seconds when the wireman is ready to install the socket outlet.



The Becker 13-amp plug and socket incorporates several good features

The plug and socket outlet are strongly made in a pleasing shade of non-inflammable, non-tracking plastic whilst all the important parts are non-rusting and are spun rigidly into place.

In addition, the firm recently marketed a 5-amp flex connector which, moulded in brown or white plastic and incorporating good quality brass components, is unusual in that it has a copper-strip earth clip connection to ensure continuity of earthing protection in 3-core flexibles.

Heating Notes

ONCE again the "Clem" toaster made by A.B. METAL PRODUCTS LTD., is available in the following colours: cream, eau-de-nil, and blue. The doors are still chromium plated.

All electric fires made by the CARRON COMPANY, Carron, Falkirk, are now fitted with guards to British Standard Specifications.

The electric firelighter introduced over a year ago by SARUM ELECTRIC LTD., 68 Brown Street, Salisbury, has been raised in price for the first time by 10% to 48s. 3d. plus 23s. 6d. purchase tax, with effect on all deliveries made on or after November 21, with the exception of those orders received before October 1, 1952.

Ediswan Clix Ceiling Rose

INTRODUCED by the EDISON SWAN ELECTRIC CO. LTD., 155 Charing Cross Rd., London, W.C.2, is a new Ediswan Clix moulded ceiling rose plate which complies with I.E.E. regulations.

The plate is a moulded block with a central cable entry tapered on the inside and housing a rubber ring. The ring slips over the outer sheath of the incoming cable and secures it. Any applied force causes the ring to roll down the taper thus providing a locking action and effectively prevents the cable from being forced back into the ceiling.

The plate has been designed for use with an Ediswan Clix ceiling rose; only two screws at standard 2 in. fixing centres are required to fix both the rose and the plate.

It is cheaper and easier to fix than the normal wooden block and is suitable also for use with a batten lampholder. List prices are as follows: Cat. No. 4511: Brown, 6s. 8d. per dozen, Cat. No. 4512: Ivory white, 7s. 4d. per dozen.

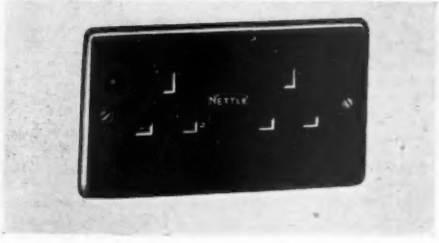
The Ediswan Clix ceiling rose plate complies with I.E.E. regulations

13-amp, 2-gang Socket Outlet

NETTLE ACCESSORIES LTD., Harper Road, Wythenshawe, Manchester, now have in full production a 2-gang, 13-amp flush-surface socket outlet, Cat. No. DF2230.

It can be mounted on to a pattress which converts it into a surface pattern. The pattress is Cat. No. P.2230.

Nettle's 13-amp 2-gang outlet takes plugs to BS 1363



The Drydex weatherproof torches are available in two sizes (2 and 3 cell)

Two New Drydex Torches

DESIGNED for the motorist and all those who need a strong reliable and weatherproof torch are two new Drydex rubber-covered models produced by CHLORIDE BATTERIES, LTD., of Exide Works, Clifton Junction, Swinton, Manchester.

The latest additions to the wide range of Drydex torches and lamps are sturdily constructed with metal cases covered in flexible rubber, unbreakable lenses and strong twin-button on and off switches.

The batteries, two Drydex T20 unit cells for the smaller version and three for the larger, are inserted at the base and held in position by a screw-type waterproof cap.

Prices: Drydex torch 3RT20 (the larger model), 13s. 8d. including 2s. 5d. purchase tax (excluding batteries). Drydex torch 2RT20, 10s. 4d. including 1s. 10d. purchase tax.

This B.M.A. 5 cwt electric van is properly coach-built, is efficient and economical

A 5-cwt. Electric Van

AN interesting newcomer to the electric battery road transport fleets is the B.M.A. electric van which is made by B.M.A. AND ELECTRICAL EQUIPMENT CO., Lansdowne Works, Alice Street, Hove 2. Neat yet sturdy and reliable in performance this little van compares very favourably with its i.c. engined counterpart.

The average 5-cwt delivery van will give a range of 60 miles on two gallons of petrol at a cost of 8s. 7d. The B.M.A. van averages 330 miles for the same amount of money.

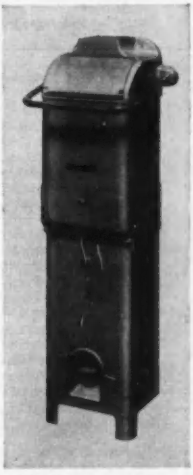
Maintenance costs are low, there being less wear on tyres and brakes; the brushes on the motor need renewing each 2 years at a cost of 8s., whilst controller spares are not expensive.

The motor of the 4 pole series wound pattern drives through double reduction chains running in oil to the offside rear wheel, whilst power is provided by 54 V 140 AH batteries specially built for the van. A 3-stage foot-operated Sharp controller is fitted. Performance: Speed 17/18 m.p.h. Range 30/35 miles per day with average half load. Turning circle with Burman steering is 20 ft, whilst unladen weight complete with batteries is 12½ cwt.

G.E.C. Small Incinerator

MANY new features are incorporated in the new rapid automatic electric incinerator which has recently been marketed by the GENERAL ELECTRIC CO. LTD., Magnet Hse., Kingsway, W.C.

This unit, which is intended for the rapid disposal of surgical dressings, sanitary towels, etc., incorporates an effective method of smoke suppression by inducing a draught.



G.E.C.'s incinerator

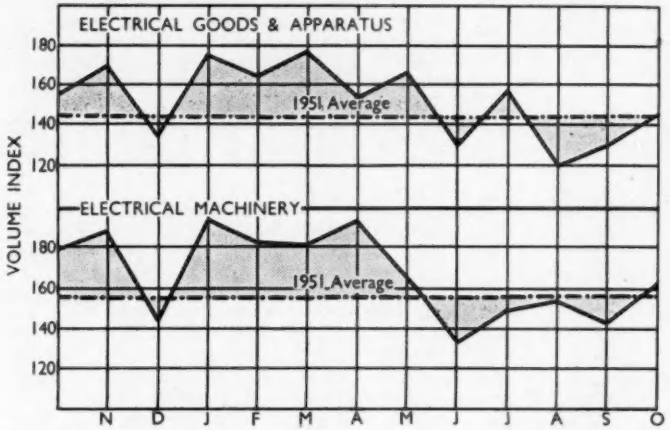
The body of the incinerator is constructed of cast aluminium built on steel angles and enclosed in enamelled sheet steel, whilst the element platform is an electrical and heat-resisting block housing a solid nickel-chrome rod element.

Pedals enable the user to operate the incinerator by foot pressure on the pedal actuating the door and switch mechanisms.

Built in below the incinerator cover are main and sub-fuses, whilst an indicating lamp is fitted which glows when the main switch is closed and gives a bright red light when the element is in operation.

Finished in stove enamelled light green polychromatic heat-resisting paint and operating on a.c. 100-250 V supplies, the incinerator caters for from 50-100 personnel.

EXPORTS AND IMPORTS



EXPORTS VOLUME INDEX

It is heartening to note that September's rise in exports of electrical goods and apparatus has continued in October. This is indicated by the Electrical Times index which has risen from 129 to 144.5, based on 1947 as 100. Electrical goods and apparatus exported during October amounted in value to £9,327,630.

Added encouragement may be gained from the fact that exports of other electrical machinery have also risen. The Electrical Times index of exports is now 163 based on 1947 as 100, the highest value since May, and exceeding the 1951 average. In value exports in this class amounted to £4,567,737.

THE month of October brought a further welcome increase in the value of electrical goods exported. Apart from heavy capital plant, the increase was spread fairly evenly over all items with the sole exception of electro-medical apparatus. Particularly welcome were the increased exports of cooking and heating apparatus. There was a marked rise also in the value of plant in the convertor, transformer and rectifier group sent abroad in the month. But complete electrical operating washing machines at £322,480 were about £9,000 lower than the corresponding figure for September. Exports of portable electric tools, at £108,773, were £35,043 higher than in September.

Description	Exports Value Month of October			Imports Value Month of October		
	1950	1951	1952	1950	1951	1952
	£	£	£	£	£	£
Telegraph and Telephone Wires and Cables—						
Submarine	22,969	39,723	175,904	—	—	—
Other	541,088	350,213	737,728	—	—	—
Rubber Insulated	448,843	669,368	494,731	—	—	—
Insulated, other than Rubber	773,114	1,025,342	1,559,134	—	—	—
Wireless Apparatus, including Valves	1,738,178	1,949,097	1,962,386	261,164	325,583	319,757
Telephone and Telegraph Apparatus	1,594,789	1,341,773	1,667,532	—	—	—
Electric Lighting Appliances, Accessories, Fittings and Parts:—						
Filament Lamp Bulbs	111,169	152,007	90,257	18,641	14,000	7,875
Other Descriptions	350,079	453,861	437,287	35,418	80,257	84,051
Batteries (primary)	158,376	239,580	211,863	—	—	—
Accumulators, Portable	175,880	415,799	216,317	—	—	—
,, Stationary	61,222	41,515	48,852	—	—	—
,, Parts and Accessories	51,184	95,013	58,207	—	—	—
Electrical Cooking and Heating Appliances	288,940	505,846	320,104	—	—	—
Ammeters, Voltmeters, etc., and Parts	112,602	122,296	150,174			
House Service Meters	111,043	145,730	117,364	29,014	40,087	51,970
All Other Instruments	144,747	136,401	136,272			
Electro-Medical Apparatus	48,310	39,875	34,355	—	—	—
X-Ray Apparatus, etc.	115,873	219,579	143,442	21,261	32,689	27,710
Insulating Materials	190,392	260,019	124,530	—	—	—
All Other Articles	472,259	615,667	641,191	94,406	154,290	193,293
Total of Group	7,511,057	8,808,704	9,327,630	459,904	646,906	684,656
Electrical Machinery:—						
Generating Sets, Diesel* (not exceeding 200kW	897,440	487,433	298,119			
,, ,, ,, (exceeding 200kW)	50,383	73,031	404,036	22,371	28,346	72,955
Other Generating Sets	291,868	331,410	110,741			
Generators minus Prime Movers and Parts†	214,225	501,546	496,520			
Motors	767,058	914,949	803,318	28,677	26,322	39,740
Convertors, Transformers, Rectifiers, Motor Control Gear, Switchgear, other machinery	1,845,002	2,193,444	2,564,255	—	—	—
Fans, Electrically and Power Driven	99,693	231,035	255,069	—	—	—
Vacuum Cleaners or Electrically Operated Appliances	302,086	746,135	322,094	—	—	—
Total Appliances and Machinery	11,978,812	14,287,687	14,581,782	510,952	701,574	797,351

* 1950 Figures include generators minus prime movers. † 1950 Figures for parts of generators only

The WEEK in NEWS

No Exports on Hire Purchase

Government Refuse Additional Help for Industry

AN appeal was made last week by a leading exporter of electrical goods for Government assistance in the export drive. It was based on the argument that other countries are offering their customers extended credit facilities, whereby they can sell their goods and regain the cost over periods of up to ten years, or, in other words, adopting hire purchase arrangements in the international market. As a result, British manufacturers are said to be losing business because they are unable to compete in this way. Payment must be c.o.d., or nearly so, to pay for imports needed immediately, and capital limitations forbid so long a wait before repayment. The request for Government help came from Sir Roland Matthews, chairman of Brush Electrical Engineering Co. Ltd., during a ceremony in which he handed over the first of 25 diesel electric locomotives built for the Ceylon Government.

Britain's main competitors in this field, cited by Sir Ronald, are Germany, France and Italy, who are giving five to ten years' credit to S. American buyers. As far as Germany is concerned, the Banks there raised about £50 million some two or three years ago to finance the idea. That sum is now almost spent.

It has been stated in the House however, that the Government is loath to finance such a method of trading, except on the limited scale now carried on by the Export Credits Guarantee Department. This department will continue to function and deal with each application sympathetically, but the cover it provides must be related to the capabilities of buyers to meet their obligations. Sir Ronald Matthews' assertion that the buyers concerned are reputable and credit-worthy—is countered by the possibility already exemplified of a foreign currency becoming inflated.

At the same time the Government is against the use of export subsidies, and full support has been given to a resolution before the International Monetary Commission protesting against such measures.

Second Electrical Exhibition Expands

LATEST information of arrangements for next year's Electrical Engineers' Exhibition is that the demand for space is exceeding all expectations. Total exhibitors to date is nearly 100, compared with 69 at the first exhibition last March. New plans are now being prepared for an area covering 82,000 sq. ft. at Earls Court, and as a result some extra space will still be available.

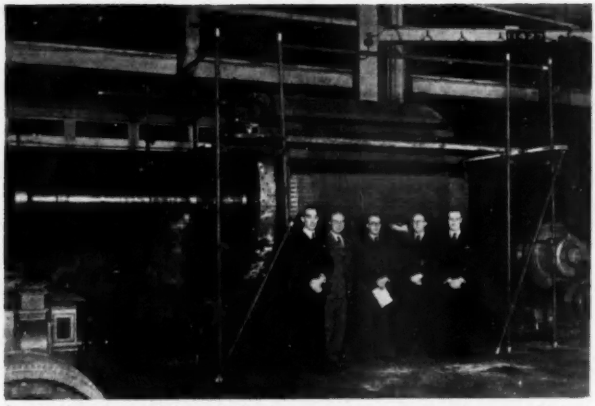
Free Dealings in Zinc Begin on Jan. 2

FREE trading in zinc, forecast by the Minister of Materials last month, will begin on January 2. An announcement issued by the Ministry last week states that arrangements have now been completed with the London Metal Exchange, and January 2 fixed for the commencement following sufficient progress in discussion with interested parties. January 1, the date originally given, is traditionally a closed day for the market. The Directorate of Non-Ferrous Metals at Rugby, will end its existing sales arrangements on December 31.

Only a relatively small tonnage of the Ministry's stocks will be released during the early months after the resumption of private trading. Arrangements for the disposal of stocks have been made with producers, consumers and Exchange members. These quantities of zinc will be released through the exchange and normal trade channels. A further announcement will be made at a later date concerning import and export licensing arrangements.

The First Half-Century

The Liverpool Tramways Committee has approached the Docks and Harbour Board to ask for its co-operation in the work of direct distribution of goods from the docks by electric trams. The Board is in hearty sympathy with the scheme, and there is every probability of it being carried out, though details are still unsettled. The impossibility of running goods trams through the crowded main streets of Liverpool, already congested with passenger traffic, will render it necessary to lay some new lines through less frequented streets from the docks, and to join these up with the outlying tramlines running to neighbouring towns. Practically it will be possible to carry goods to all points, not only on the Liverpool tramways, but on those of the S. Lancashire Tramway Co., with which the former are in intercommunication.—*From our issue of November* 27, 1902.



Dr. F. Vogt (second from left), director of Norges Vassdrags og Elektrisitetsven, with officials of Metrovick beside a rotor of a 37,500 kVA generator destined for the Aura hydro-electric station in Norway. Started before 1914 and interrupted by two wars, the station is nearing completion. Other plant is also being made by Metrovick for the project

Electrical Firms Fined for Tax Evasion

FOUND guilty on two counts of conspiring together and with others to contravene the provisions of the Hire Purchase and Credit Sales Agreements (Control) Order, 1952, the Chain Store Finance Trust Ltd., and J. and F. Stone Lighting and Radio Ltd., were each fined £5,000 and ordered to pay 150 guineas costs at the Central Criminal Court last week. The former company was also found guilty of disposing of two TV sets under an illegal H.P. agreement, and J. and F. Stone of aiding and abetting in the offence.

For the Board of Trade, Mr. Neville Faulkes said the relevant order required a down payment of one-third of the purchase price on such articles as radio and TV sets. He alleged that customers of J. and F. Stone could pay £5 down and 24 monthly instalments of £4, which transaction was covered by a rental agreement, and he suggested that this was intended to deceive the authorities.

The secretary of both companies contended that the transaction was done under a rental agreement and not under a hire purchase agreement. It was not devised by his companies but only adopted to compete with similar schemes used by others. The sets remained the company's property and managers had no instructions to inform customers otherwise. He denied any attempt to "get round" the Butler plan.

OVER £600 FOR E.I.B.A.

DURING the very successful Electrical Industries Ball held on November 14 in aid of E.I.B.A. the total sum of £609 10s. 3d. was contributed to the Association funds. £464 13s. 6d. was realised from the sale of numbered programmes, the holders of some of which gained some useful prizes, and the remaining £144 16s. 9d. was collected when the hat was passed round for special donations.

New Copper Mine in N. Rhodesia

A NEW copper-mining company is being formed in Northern Rhodesia. This information is contained in the report of the Rhokana Corporation who own the areas to be developed. The new company will be known as Bancroft Mines, which it is proposed to develop and equip for a production of 4,000 short-tons of copper a month.

Meanwhile production continues normally in the copper belt pending the appointment of arbitrators in the wage dispute.

Economy in Use of Metals Still Urgently Needed

ALTHOUGH, on current forecasts, Britain can expect to survive the next two years without any serious metals crisis, this may prove to be too optimistic, states the first report of the Metals Economy Advisory Committee. Only in the cases of lead and zinc, have the metals shortages of 18 months ago entirely disappeared. Nickel, cobalt and copper are still causing concern, and sufficient supplies can only be maintained by restrictions on less essential uses. It will be recalled that the committee was formed by the Ministers of Supply and Materials in August, 1951, to study ways in which scarce metals could be saved. The shortage of that time was no longer critical, but there was little margin to meet unforeseen demands.

The report urges the fullest publicity to the need for continuing the most economical use of metals supplies, particularly by industry, which had already co-operated well. Other recommendations include continued research by Government research establishments and Research Associations; that designs for defence material should achieve the maximum economy of metal, and that fullest possible information on future supplies should be given to industry at regular intervals.

OFFICIAL PUBLICATIONS

HYDRAULICS RESEARCH BOARD. *Report for* 1947-51 *with that of director of Hydraulics Research for* 1948-51. (*See page* 974.) H.M.S.O. 3s.

MECHANICAL ENGINEERING RESEARCH BOARD. *Report with that of director of mechanical engineering research for* 1951. (*See page* 974.) H.M.S.O. 2s.

BRITISH STANDARDS

B.S. 499 : 1952. (*Revised standard now including B.S.* 449, *Part* 2.) *Glossary of terms* (*with symbols*) *relating to the welding and cutting of metals.*

B.S. E.21 : 1952. (*Replacing Ministry of Supply* (*air*) *spec. E.L.* 1470). *Electric Cables for Aircraft* (*Glass and Polychloroprene Insulated*).

Tariffs based on Floor Area Unfair?

THE unfair method of basing industrial electricity charges on the floor area of premises was the subject of a complaint made by a deputation of the W. Midlands Area Council of the National Chamber of Trade to the Midlands Electricity Consultative Council last week. The system led to considerable variation in charges between consumers, it was stated. It was contended that the incidence of large floor area should not affect charges for consumption, which should be based on the number of points. Some businesses, by their nature, demanded large floor space. As a result charges differed considerably, inquiries in one part of the Midlands showing that bills for electricity had increased from anything between 20% and 100%.

Replying to the deputation the Consultative Council's chairman, Ald. W. Lewis, said the basis of floor area was a nationally agreed policy. It might react harshly in some cases but not everyone had suffered increases. On the whole, however, the system had worked out extremely fairly. Information supplied by the deputation would be forwarded to a Council subcommittee for consideration.

Licence Offence cost Contractor £2,500

THE principal of a Whitchurch (Glamorgan) firm of electrical engineers was fined £2,500 at Devon Quarter Sessions for a £10,000 building licence offence. He was said to have carried out £10,000 worth of rewiring work in 1950 without a licence from the Ministry of Works. He pleaded guilty.

Fluorescent & Tungsten Lighting in Chapel

CHURCHES and chapels invariably present the illuminating engineer with very particular problems, usually because the building is dated and follows the architectural design of the period. In addition the layout of a church is unique among buildings. The accompanying illustration of the chapel at Mill Hill School shows the complexity facing British Thomson-Houston's lighting engineers.

The installation may be said to have been carried out in five parts. Eight 80 W fluorescent units were mounted on the traverse beams in the ceiling, and fluorescent fittings were also employed in the apse. The stalls and organ loft were illuminated by 60 W tungsten lamps in eight tubular reflectors, and the general area of the chapel by specially finished fluorescent fittings. Tungsten lamps were used again in the entrance, the gallery and on the stairs. The chapel was built in 1898 and much of the atmosphere of the building has been retained.

Protest in S. Wales

A SIMILAR complaint against the basing of charges on floor area has been made by shopkeepers in Llandrindod Wells. The town's chamber of trade has joined the council in its protest to the S. Wales Electricity Board. It is maintained that about 90% of the people were being victimised. In some cases the small shopkeeper had been asked to pay some 250% or 300% more than before.

A SURVEY OF NATIONALISATION

A SURVEY on and recommendations for the five nationalised industries has been compiled by Mr. S. J. L. Hardie, former chairman of the Iron and Steel Corporation. The 28-page pamphlet is published by A.E.L. Mash and Associates, London. After a general discussion of nationalisation, Mr. Hardie recommends the establishment of an Independent Nationalised Board to control policy, finance and organisation of all five industries. This Board would be responsible to Parliament through a non-departmental Minister.

Building Licences Changes

CHANGES in the licensing system for building were announced by the Minister of Works last week. The licensing period has been altered to the calendar year to help those with less work during the winter. The current licensing period will end on December 31 next, and the full amounts of £500 for industrial and agricultural buildings, and £200 for others, will be available during the period from last July. During 1953 the licence free limits will be £2,000 for industrial and agricultural buildings, and £500 for other structures.

View down the Mill Hill School chapel following the installation of new lighting fittings by B.T.H. lighting engineers

Technical Staff awarded Wage Increase

AN increase in salary for technical staff in the electricity supply industry was agreed upon at a meeting of the National Joint Board last week. The new rates are back-dated to August 1. Under Schedule "A" and Classes BX to FX of Schedule "C," the salary figures for the first two years are increased by £15 p.a. on salaries of up to £400 p.a., £20 p.a. on between £401 and £700 a year, and £25 p.a. on salaries over £701 p.a. In addition salaries for subsequent years service shall be adjusted to give proportionate progression.

Similar increases have been made to the maximum and minimum salary figures for each grade in Schedule "D" and Class AX of Schedule "C."

The previous rise in pay for technical staff in the supply industry took effect from July 1, 1951. It will be recalled that a short time ago the E.P.E.A. decided to withhold their application for an increase in salaries, to see if a settled national wages policy would emerge.

Plumber-Jointers' Rise

AN increase of 2½d. an hour to plumber-jointers is announced, together with consequential rises for mates, youths and boys. Operating from the first full pay period starting on or after November 17, the new rates for plumber-jointers are 3s. 10¾d. an hour in the London area, and 3s. 7¼d. throughout the rest of the country. For plumber-jointers' mates, the hourly rates are 3s. 3¾d. in London, and 3s. 0¾d. for the remainder of the country.

Exhibitions to Show Two New Products

IN order to advertise two new products, the Superform Fuseboard and the Combination Fuse Switch Contactor, the English Electric Co., Ltd., is arranging a series of exhibitions at provincial centres throughout the U.K. These displays will be at Newcastle (December 3 and 4), Glasgow (January 14 and 15), Sheffield and Manchester.

The Superform is a streamlined metal-clad fuseboard, arranged for surface and flush mounting, which is designed to appeal to those concerned in the electrification of public and similar buildings. Distinctive features are ease of access, spaciousness, safety precautions and provision of phase barriers and spare H.R.C. cartridge fuse links. The Combination contactors are for direct on-line starting of three-phase 400/440 V motors. They are in two sizes, suitable for motors up to 15 h.p., and may appeal to the factory engineer.

Part of the Eccles Old Road, Salford, the scene of a large street lighting installation carried out by Metropolitan-Vickers Ltd. The scheme comprised 109 So Fifty-Two fluorescent lanterns with 140 W sodium lamps. These replaced 500 W filament lamps

Christmas Lecture on Sound Broadcasting

FOR the seventh year, the I.E.E. is organising a Christmas lecture intended primarily for older schoolchildren. Past experience has shown that the popularity of these lectures is by no means confined to children, and a fair proportion of the annual audience comprises adults. The subject of this season's address is "Sound Broadcasting," and the speaker will be Dr. K. R. Sturley, head of the B.B.C.'s engineering training department. The lecture will be given this Christmas at 3 p.m. on both January 1 and 2 in the I.E.E. headquarters' lecture theatre.

New Coal Price and Electricity

ANY increase in the price of coal automatically affects the cost of electricity production. In consequence, readers will undoubtedly be deliberating on the results a rise in transport rates will have on coal prices, which are to go up by about 1s. a ton. Mr. G. Lloyd confirmed the expected increase in the House of Commons on Monday when he said the average increase in coal price would be about 7d. a ton for industrial coals and about 1s. a ton for domestic coals. On this basis and remembering that Britain's power stations consume some 55·8 million tons of coal a year, the added cost to the B.E.A. should be about £1·16m. a year.

Large Turbo-Alternators

IN our issue of October 30, we quoted Mr. F. Shakeshaft, in the discussion on Dunston "B" station, as saying that a 120 MW set using reheat and conditions of 600 lb/sq in., 650° F was now a practicable proposition. We have been asked to point out that what he actually suggested was that "the 120 MW set designed for steam conditions of 1,500 lb/sq in., 1,000° F with reheating at 1,000° F was now a practicable proposition."

Simple Procedure in Erecting OH Lines

BEFORE an overhead line can be erected there are numerous amenity associations and other bodies, quite apart from Government Departments, who have to be advised and contacted for one reason or another. Following many requests, E.D.A. has now compiled and published in diagrammatic form a co-ordinating procedure which it is hoped will simplify administration and thus hasten the erection of the lines. The complete diagram measures 28¼ in. by 19 in., is printed in three colours, and with accompanying notes should explain the best procedure to adopt.

B.I.C.C. Students Win Educational Awards

A SIMPLE ceremony took place recently at the Prescot works of B.I.C.C. when educational awards were presented to over 150 employee students. About a third of that number had taken courses at the company's Day Continuation School, while the remainder were students who had gained successes at local technical colleges. Speaking at this annual function, Lt.-Gen. Sir Ronald M. Scobie, director, said opportunities for advancement were always present for those who had acquired the appropriate training and education.

The Blind and Electricity

THE remarkable achievements of the blind continue to gain the admiration of those who are not afflicted in that way, and the latest annual report (for 1951-52) of the National Institute for the Blind does not lack examples of the prowess shown by the less fortunate members of our community. Being particularly interested in the electrical industry, we note that blind persons continue to learn particular tasks, go to factories to learn trades and become completely rehabilitated. One illustration in the report particularly impresses. It shows a blind operator assembling meters and similar apparatus to an electrical control panel.

Interior of the new radio and electrical exhibition van which Kerry's (Great Britain) Ltd. are using to take a selected range of products to their customers. The travelling showroom is on the road and at present emphasises possible Christmas gifts

NEWS IN BRIEF

A startling though pleasant reminder that Christmas is fast approaching has reached this office in the form of a gift of a calendar. It comes from Ateliers de Constructions Electriques de Charleroi, Belgium, and we heartily reciprocate the good wishes it brings.

"Which Fuel?" was the subject of a Brains Trust organised by the E.A.W. which was held at Brighton last week. The team comprised representatives of the electrical, gas and solid fuel industries.

The publishers of *Research* are to run a Prize Essay Competition to encourage the writing of papers suitable for assimilation by a non-specialist reader having some general scientific knowledge.

Siam will be introduced to television next month. The transmitters for this service have been made by Marconi's Wireless Telegraph Co., and many of English Electric's receivers will be used.

Bookings for the Coronation B.I.F. at Castle Bromwich are understood to be as good as the 1952 Fair and a "full house" is expected by the end of this year.

Johnson and Phillips Dramatics Group opened their 1952-53 season with the farcical comedy "Lady—Be Careful."

Radiotelephone services operated by Cable and Wireless Ltd., between Hong Kong and Macao and Formosa and the Philippines are now linked to connect those places with each other through Hong Kong.

Despite difficulties in the past year, Metway Electrical Industries staff have received a bonus of 15% in gross wages, plus ½% for each year's service.

Over 60 long service employees with their friends and relatives were entertained to dinner recently by the management of Lancashire Dynamo and Crypto Ltd.

A cocktail party was held last Thursday at the offices of Thor Appliances Ltd., to mark the visit of Mr. Raymond J. Hurley, Chairman of the Thor Corporation, Chicago, to Great Britain. Mr. Hurley has been making a short tour of Europe to see the market potentialities for himself. At the party, he met several Thor dealers in this country.

SEEBOARD'S LANDMARK

THE S.E. Electricity Board has passed a notable landmark in its history. A few days ago the Board connected its 1,000,000th consumer. This was included among a number of facts and figures given by the chairman recently. Since the Board's inception in April, 1948, we note that 150,000 new consumers have been added to its books, some 1,800 miles of new mains have been laid, and 2,000 new substations constructed. Some 2,000 farms have been supplied with electricity and over 10,000 more street lights provided.

In his statement, the chairman adds that despite rising prices, the price of electricity has been kept as low as possible by cutting the Board's own costs to a minimum, and that policy would be continued to the limit.

Questions in Parliament . . .

Ridley Committee

A debate in the House of Lords last week was devoted to a consideration of the Ridley Report on fuel and power policy. It was initiated by Lord Macdonald of Gwaenysgor, who in the course of his remarks commented on the shortage of smokeless fuel, which was needed for many of the improved grates being installed in houses. He was followed by Lord Ridley, who developed some of the ideas behind the recommendations in the report. He emphasised that his committee had felt that a fuel policy could not be based on efficiency considerations alone. Economies had to be considered as well. for "it would not be worth spending more than so many pounds to save so many tons of coal a year." Continuing, he emphasised that the committee was not in principle against any promotional tariff for electricity. "The history of the electricity industry shows that these promotional tariffs have not only increased sales very largely, but have also improved the load factor considerably."

Later in his speech, Lord Ridley confessed himself surprised at what a close relationship there was between the different costs of different fuels. He instanced water-heating, which in some seasons and in off-peak hours was most economically performed by electricity. He emphasised also that the committee was advised that there was an advantage in having radiant heat rather than convected heat in a room.

Government Views

Lord Leathers, Secretary of State for the Co-ordination of Transport, Fuel and Power, intervened in the debate to give the Government view. He added little to what had been said in the earlier Commons debate, saying the Government had only reached a "half-way house" in their consideration of the report. He admitted that there was a strong case for replacing coal-fired locomotives, but emphasised that the capital investment required would be "huge." With regard to diesel or diesel-electric drives, he noted the advantage of having a suitable home-based fuel supply.

The Government rejected the recommendation that heating methods and installations in new industrial and commercial buildings should be subject to planning control. In connection with domestic electricity tariffs, he emphasised the difficulty in terms of apparatus of any complication in form. He noted that charging for m.d. on a monthly rather than a yearly basis "is already the normal practice for industrial consumers." The B.E.A. was being asked to reconsider the commercial maximum demand tariff in the light of this recommendation.

Amongst other speakers was Viscount Falmouth, who thought that the capital cost of extra-high efficiency electricity generating plant should be carefully considered in the light of the question, "Which is the more important: higher efficiency or lower capital charges?" He thought that railway electrification was not practical politics purely from coal economy consideration.

Cost of Electricity Poles

Questions were asked as to what the Government proposed to do concerning the increased cost of electricity transmission poles and the adverse effect it was having on the extension of supplies to rural areas. Cdr. Maitland pointed out that the price of 30 ft. poles had risen from £6 5s. to £10 6s. since mid-1951. Mr. Mackeson replied that current prices reflected the previous year's price of soft wood which rose in 1951. A fall in price could be expected in due course corresponding to the reduction in timber prices this year. He said he would draw attention to the point raised concerning the high standard of construction required for the poles, which invariably excluded the use of British timber.

East Kilbride's Research Laboratory

The Parliamentary Secretary to the Ministry of Works has stated that he could not forecast when the building and staffing of the Mechanical Engineering Research Laboratory at East Kilbride would be completed. Capital expenditure had limited progress, but work to date, which included the erection of some buildings, had cost about £1 million. Work was to start soon on another building to cost about £400,000.

Private Generation

Mr. G. Lloyd told the House, on Monday, that it had been decided to implement the Ridley Committee's recommendation to abandon restrictions on private independent electricity generation. An announcement would be made shortly.

Loan Charges

Total interest payments in the year ending September 30 last, were £22 million, compared with £18 million for the previous year, said the Minister of Fuel and Power. He had been asked concerning the extra financial charges imposed since October, 1951, on the B.E.A. by the higher rates of interest chargeable on electricity loans. The Minister added that the increase was due mainly to additional capital raised by the industry, but partly to changes in interest rates.

Copper Restrictions

Mr. Drayson asked whether S.I. 1951, 275, could be modified to allow the use of copper freely, or in a more favourable ratio than the present 50 to 1, where such ratios refer to the selling price of an article in proportion to the value of copper content. He also asked if Regulations could be removed on articles containing not more than 2 oz. of copper. Mr. H. Strauss said the modification of the present restrictions was being considered.

Expenditure on Research

The Prime Minister last week rejected a proposal that an inquiry be made into the expenditure of over £161 million on research and development included in the estimates to discover whether it was being spent wisely and effectively. No inquiry could cover such a wide field, he said; moreover, he was satisfied that the Ministers concerned carefully scrutinised all such expenditure.

Notice of Motion

Last week, Sir E. Boyle gave notice that he would call attention to the report of the Select Committee on Nationalised Industries, and move a resolution on December 5.

Road Transport Lighting

A Private Member's Bill, entitled the Road Transport Lighting (Amendment) Bill, which is designed "to amend the Road Transport Lighting Acts of 1927 and 1945, and for purposes incidental thereto," was read the first time last week. It was introduced by Mr. Powell and will be read a second time on January 30.

Coal Exports and Stocks

Asked concerning the progress made in the export of coal during the current year, Mr. G. Lloyd said that in the first 10 months, 9·8 million tons were exported. It was estimated that a further 2·2 million tons would be exported during November and December.

As regards stocks of coal in this country, the Minister said on November 1 stocks of house coal stood at 2·1m tons, and stocks for power stations, gas works, railways and various industries stood at 16·4m tons. Comparative figures in 1951 were 1·2m tons and 15·3m tons respectively. Undistributed stocks were 4·7m tons. He went on to remark it would be unwise for anyone to say he was satisfied after so many winters of fuel crises, but the situation was much better. He also stated that domestic consumers had bought 300,000 tons fewer in the 26 weeks of summer. In answer to a further question, Mr. Lloyd said he was arranging for returns of small industrial consumers' usage and stocks to be made monthly instead of weekly. It would be done as soon as possible for those who used coal only.

Consumption at Bankside

The new Bankside power station was expected to consume about 40,000 tons of fuel oil annually, containing about 1,600 tons of sulphur which would form about 3,200 tons of oxides on combustion, the Minister of Fuel and Power stated last Monday. About 5% would be discharged into the atmosphere, he added.

Electricity in Scotland

Secretary of State for Scotland told the House last week he was unable to say when the investigation into the question of electricity supplies in Scotland would be complete. Asked whether it was proposed to interfere with the Hydro-Electric Board, he referred the questioner to his reply on December 4 last. On that occasion he stated he did not contemplate that any change in the organisation of the industry would impair the special responsibilities of the N. of Scotland Hydro-Electric Board.

Highland Flood Damage

Col. Gomme-Duncan asked what progress had been made in repairing flood damage to Loch Quoich and Loch Garry hydro-electric works. Mr. Stuart replied that repair work on contractors' temporary structures at Loch Quoich was in progress, but further high flows had hindered operations. Other arrangements were made at Loch Garry to dispense with the need for repairs, he said.

Company Activities . . .

British Electric Transformer

There was a slight increase in the trading profit for the year to June 30 last, but higher taxation reduced the net profit, as we noted on November 6. The substantially higher current assets shown in the balance sheet are mainly attributable to an additional £160,000 in stock in hand and work in progress. The sum of £84,426 was spent during the year on the expansion and replacement of plant and buildings, and contracts for a further expenditure of £180,518 were outstanding at the end of June last.

Burco Ltd.

In these days of restrictions on sales of domestic appliances, it must be of some satisfaction to slightly increase the trading profit, as in the case of this concern. The reduction in the net profit shown is due primarily to the Excess Profits Levy. Mr. D. K. Ward, chairman and managing director, believes that the time is approaching when the Electricity Boards will be compelled to urge the use of electricity in the domestic field to justify the enormous capital expenditure on new power stations. The cessation of power cuts, restoration of h.p. facilities, and a rational tax policy would lead to an expansion in the industry, in which the company would participate.

Year to Sep. 30	£ Trading Profit	£ Net Profit	% on Ord.		Ord. Price	
			Earn'd	Paid	High	Low
1948	103,524	42,890	74	35	28/-	22/6
1949	98,356	39,535	68	35	23/-	17/6
1950	122,647	54,289	94	35	26/-	19/4
1951	144,574	60,475	108	38‡	24/9	21/3
1952	156,448	54,281	113	35	21/9	18/-

Crompton Parkinson

Although the increase in trading profit is regarded as satisfactory, an additional £130,000 has been absorbed by taxation and specific reserves. But no provision has been made for Excess Profits Levy since, as far as can be ascertained, there is no liability up to June 30 last.

Year to June 31	£ Trading Profit	£ Net Profit	% on Ord.		Ord. Price	
			Earn'd	Paid	High	Low
1948*	1,687,968	—‡	48	22½	30/4	23/9
1949	1,627,862	—	37	22½	28/9	21/6
1950	1,799,620	—	21	†11¼	12/7	11/1
1951	1,837,431	361,315	20	11¼	13/1	9/6
1952	2,045,201	397,934	22	11¼	9/9	7/3

* To September 30. † Capital bonus 100%.

‡ Not comparable due to change in form of accounts.

The year witnessed an increase in production costs, and competition, particularly in overseas markets, has been intensified. Yet despite these difficulties, along with import restrictions, the company was able to increase the value of its direct exports by nearly 30% in comparison with the previous year, Mr. Albert Parkinson, chairman, points out. Indirect exports also increased considerably. While continuing to develop the export trade, manufacturing facilities overseas are to be expanded.

Electric and Musical Industries Ltd.

There was an increase of £1,400,000 in U.K. stock and work in progress. Although total sales in the U.K. and in overseas territories during the year to June 30 last were greater than for the previous year, the recession in the early part of the

Year to June 31	£ Trading Profit	£ Net Profit	% on Ord.		Ord. Price	
			Earn'd	Paid	High	Low
1948	1,232,752	498,192	30	8	21/9	14/9
1949	1,040,418	318,497	19	8	22/4	14/9
1950	916,238	268,802	16	8	28/6	16/4
1951	1,994,507	663,000	43	12	25/1	17/9
1952	1,626,377	402,365	20	12	18/11	13/-

period and the closing of many export markets resulted in an increase in those assets, states Sir Alexander Aikman, chairman.

Enfield Cables Ltd.

The company is making a good recovery from the setback suffered in 1951, it would seem from interim unaudited accounts for the first six months of 1952 just issued. These indicate that the group profit before taxation and provision for intangible assets of subsidiary companies, amounted to approximately £192,000 for the half year. That figure compares with £71,752 for last year and £396,796 for 1950. In the accounts to June 30 last, provision of £136,000 has been made for losses on the Brynmawr Rubber business for the half year and credit of £28,000 has been taken for exceptional profit. Reference is made to the cable factories presently operating at a high level now that copper is more freely available. But in view of the uncertainties at Brynmawr and the need to build up the financial resources, the board is restricting the interim dividend to 2%, as against 3¼% last year.

Pye Ltd.

Having received the permission of the C.I.C. to the issue of Deferred Ordinary shares, it is proposed to make a rights issue of one for three held.

Sun Electrical Co. Ltd.

Only a moderate increase in total turnover was achieved during the year, largely due to purchase tax on household appliances, radio and t.v. The rise of nearly £50,000 in the value of stocks was due to forward contracts placed in anticipation of shortages of certain lines, some of which did not materialise, and to the stock requirements of two

Year to Apr. 30	£ Trading Profit	£ Net Profit	% on Ord.		Ord. Price	
			Earn'd	Paid	High	Low
1948	113,880	41,482	71	7½	21/-	21/-
1949	79,776	23,557	36	7½	22/6	22/-
1950	89,374	27,184	43	10	23/9	20/6
1951	132,757	44,249	80	15	25/6	20/-
1952	113,545	33,057	57	15	26/-	25/6

new branches, that old stalwart of the contracting and wholesaling industries, Mr. W. R. Rawlings, the chairman, states, The current trading position also has not reached the high level of sales which had been achieved by this time last year, he says.

Yarrow and Co. Ltd.

In regard to a considerable reduction in the amount of work in progress, stores, etc., the chairman, Sir Harold Yarrow, points out that this

Year to June 31	£ Trading Profit	£ Net Profit	% on Ord.		Ord. Price	
			Earn'd	Paid	High	Low
1948	155,030	65,934	44	15	5½	4½
1949	179,099	70,184	47	15	5⅝	79/3
1950	236,164	83,242	55	15	5	80/-
1951	377,279	87,516	88	15*	67/6	48/9
1952	615,093	108,818	137	20	57/6	51/3

* Capital bonus of 100%.

is due to the completion of a number of important contracts during the year. All departments of the company have been busy, and with orders already in hand are likely to remain so in the meantime, with a high proportion of export work.

Dividends Declared

Allied Ironfounders.—Interim of 7½% (*same*).

Aerialite Ltd.—Final of 55% making 88⅓% (*both same*).

Burgess Products.—Dividend of 25% (*22½%*). Group profit £202,454 (*£145,653*).

General Cable Manufacturing Co.—Second interim of 18% (*same*) but on larger capital.

Glenfield and Kennedy.—Interim of 5%.

Hackbridge and Hewittic Electric Co.—Interim of 5% (*same*) payable on December 16.

Johnson and Phi.lips.—Interim of 7½% (*same*).

Oldham and Son.—Interim of 5% (*same*) but on doubled capital.

Peto Scott Electrical Instruments.—Dividend of 12½% (*same*) on doubled capital.

Plessey Co.—Final of 12½%, making 25% (*22½%*). Group trading profit is £819,222 (*£637,474*).

Scottish Cables Ltd.—Interim of 7½% (*10%*) on doubled capital, payable on December 31.

Electric Supply News . . .

Brighton

The first of four 52.5 MW turbo-alternators in the new Brighton 'B' power station is expected to go on load next month. For some weeks past the plant has been undergoing the usual tests. Construction of this station commenced about five years ago.

Carlisle

The North Western Electricity Board has rejected the City Council's proposal that it should make a payment to the Council for the granting of wayleaves for laying underground cables on housing estates. In order that the supply of electricity to new estates will not be delayed, the City Council has accepted the Board's terms.

Skye

A £1,250,000 scheme of the North of Scotland Hydro-Electric Board, to provide electricity throughout Skye was formally inaugurated last week by Lady Macdonald, when 220 miles of h.t. line were energised. In conjunction with the opening ceremony an exhibition of electrical appliances was held by the Board.

At the ceremony, giving figures of the progress made in supplying power to Skye, Lord Macdonald said that 220 miles of cable had been completed out of the 386 in the scheme. Work had commenced on a further 85 miles, and the balance of 81 miles was about to be begun. So far 1,250 consumers had been connected, and a further 400 would be connected by the end of this year. The total cost of the Storr Lochs scheme, in Skye, was about £1,250,000.

Southern Board

The cost of meter reading in the Southern Electricity Board's area had risen by 19%, whereas other boards' meter reading costs had gone up by only 12%; also, the Southern Board's transport costs had jumped by 34% against 18% elsewhere, Alderman E. W. B. Gill told the Consultative Council last week. He asked that the Board should give an explanation of such figures. On a recommendation by Mr. Brandreth it was also agreed that the Board should be asked to consider the reintroduction of hired wiring or some form of assisted wiring scheme.

South-West Scotland

The charges made by Electricity and Gas Boards for supplying new housing estates was the subject of discussion at last week's meeting of the South West Scotland Consultative Council. Councillor Wilson, of Motherwell, thought the two bodies should get together. He believed a flat rate of £10 per house would be better in place of the present alternative rates of £3 and £15 according to the nature of the services supplied. Treasurer J. Porter, of Greenock, thought any attempt at co-operation with the Gas Council was wrong. The best results from any progressive movement came as the result of competition. Their council was supposed to be meeting as representatives of electricity consumers. Some appeared to think they were representing the interests of ratepayers generally, he went on. In his view their attitude should be that a person with an all-electric house was automatically entitled to get advantages that his larger consumption entitled him to compared with the person who used little electricity. After further discussion the council agreed to note the position and take no further action meantime.

Stratford-upon-Avon

Although the Minister of Fuel and Power has rejected the objection of the Stratford-upon-Avon Town Council to the placing of overhead cables to supply Cliffe Cottage at Alveston, the council has refused to sanction the erection of similar lines to serve six cottages in the same parish. Several members, including the mayor, suggested that the proposal be sanctioned, for they maintained, there were weaker grounds for objection than in the case of Cliffe Cottage. The action of the Town Planning and Plans Committee was referred to as delaying tactics. But Ald. T. Matthews stressed that it was a matter of principle. Years ago the Committee took the line that it was their duty to oppose all o.h. cables in the borough, he said.

LIGHTING SCHEMES

Aberdeen.—The Watching and Lighting Committee has agreed in principle to a scheme for improved lighting in Union Street, Castle Street and Union Terrace.

Chester.—The Publicity Committee has proposed a Coronation floodlighting and illuminations scheme costing £5,750.

Clevedon.—The U.D.C. is considering the conversion of street lighting from gas to electricity.

Heywood.—Application is being made for consent to borrow £4,000 for conversion of side street lighting from gas to electricity.

Manchester.—The Town Hall Committee has proposed a new lighting system for Piccadilly Gardens costing £2,300.

Peterborough.—T.C. is urging Ministry of Housing to authorise street lighting schemes on new housing estates. The lighting in Westwood Street and Walpole Street is to be improved at a cost of £1,960.

Stirling.—T.C. to apply for consent to borrow £17,985 for improved lighting on the main roads.

Ware (Herts).—U.D.C. to prepare scheme for improved lighting in Amwell End, High Street and Baldock Street, and a sodium lighting scheme for Presdales Estate.

Wolverhampton.—It is proposed to spend £2,300, including the purchase of certain equipment, on floodlighting of certain buildings in connection with Coronation celebrations.

Commercial Information

CONTRACTS OPEN

HOME

Nov. 28.—Stepney B.C. Electrical installation in blocks of flats in Sidney St. scheme. Sydney Clough, Son and Partners, Devonshire Close, 39 Devonshire St., W.1. Deposit £2 2s. (See Oct. 23 issue.)

Nov. 29.—Stalybridge T.C. Conversion of street lighting from gas to electricity, comprising supply of swan necks to existing columns, new concrete columns, 80 W H.P.M.V. lanterns, time switches, etc., for some 420 lamps. G. D. Sanderson, Borough Engineer, Town Hall.

Nov. 30.—Tottenham B.C. List of supplies required during year beginning April 1, 1953, includes electric lamps. Applications to M. Lindsay Taylor, Town Clerk, Town Hall, N.15.

Dec. 1.—Chippenham. Rewiring for power, lighting, patients' call system and radio system at St. Andrew's Hospital. A. N. Irens, consulting engineer, Haycroft, Filton, Bristol. Deposit £2 2s. (See Nov. 6 issue.)

Dec. 1.—East Riding. Installation of electrical services at Cottingdean secondary school. Application to County Architect, County Hall, Beverley.

Dec. 1.—Farnworth T.C. Installation of electric lighting and heating in 36 houses on Plodder Lane South site. Borough Engineer and Surveyor, Town Hall. Deposit £1 1s.

Dec. 1.—Manchester. Electrical installation at 'F.' Home, "Newholme," Nell Lane. City Architect, Town Hall. Deposit £1 1s. (See November 13 issue.)

Dec. 1.—Rothwell (Yorks) U.D.C. Electric wiring of 48 houses on Haigh Rd. site. Documents from R. A. Easdale and Son, architects, County Chambers, Bradley St., Castleford.

Dec. 1.—St. Helens T.C. Supply, erection and wiring of 66 concrete standards with 250 W H.P.M.V. lanterns for new street lighting scheme. M. Ward, Borough and Water Engineer, Town Hall. Deposit £2 5s.

Dec. 1.—West Hartlepool T.C. Supply of equipment for illumination of pedestrian crossing beacons. Chairman of Watch Committee, Town Clerk's Office, Municipal Bldgs.

Dec. 1.—West Riding. Renewal of electrical installation at Elland grammar school. County Architect, "Bishopgarth," Westfield Rd., Wakefield. Deposit £2 2s. (See November 13 issue.)

Dec. 2.—Northern Ireland. Electrical installations in 192 dwellings at Rathcoole No. 2, Whitehouse; 198 dwellings at Ballymena; and 66 at Coleraine, for N.I. Housing Trust. Trust Offices are at 12 Hope St., Belfast. Deposit 10s. each scheme.

Dec. 3.—Hull. Electrical installation at Estcourt primary school. City Architect, Guildhall. Deposit £1 1s.

Dec. 5.—Harrow U.D.C. Supply and installation of 197 140 W sodium lanterns, lamps and control gear in Group A, for various roads. Engineer, J. H. Melville Richards, Council Offices, Uxbridge Rd., Stanmore. Deposit £2.

Dec. 5.—Swanage U.D.C. Supply and erection of 78 open-type 140 W sodium lamps and 43 open-type 60 W sodium lamps with concrete columns. P. S. Browne, Surveyor, Town Hall.

Dec. 6.—Bridgend U.D.C. Supply and installation of sodium and fluorescent lighting in Class A, along various roads in borough. Engineer and Surveyor, Council Offices, Glan-Ogwr, Bridgend. Deposit £2 2s.

Dec. 8.—Northern Ireland. Electrical installation in 24 houses at Kilrea for N.I. Housing Trust, 12 Hope St., Belfast. Deposit 10s.

Dec. 8.—Spalding R.D.C. Supply, erection etc. of pumping machinery. One pump to be driven by electric motor and other by diesel engine, each complete with switchgear and ancillary equipment. Consulting Engineers, Silcock and Simpson, 10 Park Row, Leeds. Deposit £5.

Dec. 8.—West Hartlepool T.C. Supply installation, etc., of electrically driven sewage pumps and ancillary plant and equipment. Borough Engineer and Surveyor, Municipal Buildings.

Dec. 8.—West Riding. Renewal of electrical installation in Goole grammar, and Henley C.E. schools. County Architect, "Bishopgarth," Westfield Rd., Wakefield. Deposit £2 2s. (See Nov. 20 issue.)

Dec. 8.—Liverpool. Partial renewal of electrical installation at William Roberts Baths. Baths Manager and Engineer, 62 Fontenoy Street.

Dec. 9.—Co. Down. Electrical installation in intermediate school at Kilkeel. Consulting Engineer, A. N. Irens, Bennett Building, 46 Donegall St., Belfast. Deposit £5 5s.

Dec. 10.—Ilkley U.D.C. Installation of mercury lighting (involving 62 columns) in new street lighting scheme. Council's Surveyor, Town Hall. Deposit £3 3s.

Dec. 10.—Manchester. Supply of equipment for 280 pedestrian crossing beacons. City Surveyor, Town Hall. Deposit £1 1s.

Dec. 10. — Newcastle-on-Tyne. Substitution of electric lighting for gas in 930 houses on Walker estate (contract in nine sections). City Architect, 18 Cloth Market.

Dec. 11.—Bootle T.C. Electrical installation at secondary school in Fernhill Rd. Borough Surveyor, Town Hall.

Dec. 11.—Widnes T.C. Supply, erection, and fixing of 1·21 miles of street lighting to Group A. Borough Engineer and Surveyor, Town Hall. (See Nov. 20 issue.)

Dec. 12.—Cornwall. Supply of equipment (approx. 18 units) for lighting zebra crossing beacons. Clerk of County Council, County Hall, Truro.

Dec. 12.—Malden and Coombe T.C. Supply and erection of (a) 68 H.P.M.V. lamps on either ordinary or prestressed concrete columns; and (b) 74 sodium lamps on either ordinary or prestressed concrete columns, for street lighting in Coombe and Traps Lanes. John Apse, Borough Engineer, Municipal Offices, New Malden. (Advertised in this issue.)

Dec. 12.—Sheffield. Electrical installation at Firs Hill school. W. Geo. Davies, City Architect, Town Hall. Deposit £2.

Dec. 13.—Edinburgh. Supply and

installation of electric lift at Longmore Hospital. Ross, Barker and Wallace, 27 Rutland Square.

Dec. 16.—Bromley T.C. Improvement of street lighting along 1½ miles of London Rd., High St., and Masons Hill. Applications to Borough Engineer, Municipal Offices, by Dec. 2. Deposit £2 2s. (See Nov. 20 issue.)

Dec. 18.—Sowerby Bridge U.D.C. Electrical engineer in 26 dwellings on Kershaw site. Architect and Surveyor, Beech Royd, Beech Rd., Deposit £1 1s.

Dec. 18.—Brighouse T.C. Supply and erection of 33 concrete columns, lanterns and tungsten lamps in Class B on Field Lane estate, Rastrick. Borough Engineer, Commercial St. Deposit £1.

Jan. 5.—Bletchley U.D.C. Nine sets of electrically driven vertical unchokeable sewage pumps and ancillary equipment for three pumping stations. Engineers are John Taylor and Sons, Artillery House, Victoria St., London S.W.1. Deposit £5.

Jan. 10.—Dagenham T.C. List of supplies for year beginning April 1 next includes electrical lamps and supplies. Borough Engineer and Surveyor, Civic Centre.

No date stated.—Doune (Perth) T.C. Electrical work in erection of block of flats for old people. Apply, D. A. McNeill, Town Clerk, Dunblane.

OVERSEAS

Details of items marked may be obtained on application to the Board of Trade, Horseguards Avenue, S.W.1, quoting reference.*

Dec. 16.—India. Supply of electrically operated circular saw and automatic circular saw bench. Director General of Supplies and Disposals, Shahjahan Rd., New Delhi. B.o.T. (Ref.: CRE 39097/52).*

Dec. 23.—Uruguay. Supply of straight insulator pins, materials for splices and T-joints, and cross arms, for h.t. lines. Usinas Electricas y Telefonos del Estado. B.o.T. (Ref.: CRE 38812/52).*

Jan. 2.—India. Supply of 11,000/400 V pole mounted distribution transformers, 3-phase 50 c/s (81 of 100 to 500 kVA and 30 of 50 to 100 kVA). Director General India Store Dept., 32-44 Edgware Rd., London W.2.

Jan. 12.—New Zealand. Supply of considerable quantity of switchboard wire, 0·024 in. diameter, tinned, waxed, single lay up. Director General (Stores Div.), G.P.O., Wellington. B.o.T. (Ref.: CRE 38564/52).*

Jan. 14.—New Zealand. A total of about 6,900 yd of cable and 3,500 yd of cord to various specifications required by Post and Telegraph Dept., G.P.O., Wellington. B.o.T. (Ref.: CRE 38592/52).*

Jan. 14.—New Zealand. Supply of three diesel engine generator sets, maximum output 31·8 V at 2 kW d.c. Director General (Stores Div.), G.P.O., Wellington. B.o.T. (Ref.: CRE 38188/52).*

Mar. 20.—New Zealand. Dunedin Drainage and Sewerage Board invites tenders for supply of pumping plant with electric motors, switchgear and control gear suitable for 400 V, 3-phase, 50 c/s supply, for Jervois St. Station. Board is at Municipal Chambers, Dunedin. B.o.T. (Ref.: CRE 38168/52).*

CONTRACTS PLACED

Aldridge (Staffs.) U.D.C. Erection of 25 mercury lamps in Walsall Rd., Anchor Rd. and High St., Midlands Electricity Board, £2,000.

Durham. Supply of lamps to Hospital Management Committee for year ending Oct. 31, 1953. Siemens Electric Lamps and Supplies Ltd.

Hammersmith B.C. Supply and erection of 175 flashing beacons, General Electric Co., Ltd., £3,360.

Hendon T.C. Electrical installations on Broadfields Ave. site, Norwest Services Ltd., £2,260; and same on Cricklewood Lane site, Eastern Electricity Board, £1,560.

Holborn B.C. Electrical work in 58 flats in Red Lion Sq., Gratte Bros., Ltd., £4,270.

Hull. Electrical work in Wivern primary school, J. Todd, £2,948.

Lewisham T.C. Provision of lighting equipment for pedestrian crossing beacons, Revo Electric Co., Ltd., £1,007.

London. Electrical installation for sedimentation tanks at northern outfall works, Beckton, London Electricity Board, £36,665.

Middlesbrough T.C. Street lighting scheme on Berwick Hills site, N.E. Electricity Board, £3,434.

Middlesbrough. Lighting and heating installation at Longnewton pumping station. C. Horne and Co. Ltd., £2,141.

Your Queries Answered

Hose type rubber tube incorporating two bare conductors for signalling purposes, makers of? J.K.—Although this apparatus has been used in motor racing there is no firm known to us to be making this equipment at the present time. We can only suggest the system such as is made by the W. R. Sykes Interlocking Signal Co., Ltd., 26 Voltaire Rd., S.W.4, which works on the pneumatic principle. (24453)

"Lyndon" stocks and dies, makers of? B.B.—Tom Carrington and Co., Ltd., Lydon Tool Works, Stoney Lane, West Bromwich. (24459)

Shaving mirrors illuminated from behind the glass, makers of? B.C.—Holt Siron and Co., Ltd., Dominion Works, Alfred Rd., Birmingham 11, and Metlex Industries Ltd., 77 Sumner Rd., Croydon. (24465)

"Wahl" animal clippers, makers of? M.I.—Wahl (England) Ltd., 215 Putney Bridge Rd., S.W.15. (24472)

"Johnson" floor polishers, suppliers of? L.B.—S. C. Johnson and Son, Ltd., West Drayton, Middx. (24479)

"Aneta" irons, repairers of? S.D.—Brun Electric Services, Bank Parade, Burnley. (24483)

The above are selected from questions we have answered this week. If you have a query, send it to us.

ANSWER WANTED

"Tom Tit" non-electric kettles, makers of? S.B. (24488)

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

Auto Cables Ltd. Manufacturers of and dealers in cables, dynamos, motors, armatures, transformers, etc. Cap.: £100. Dirs.: H. E. Wright, 138 Rushgrove Av., Colindale, N.W.9; and Eva R. Shapland, 47 Beverley Drive, Edgware, Middx.

Dymet Alloys Ltd., 99 Fenchurch St., E.C.3. Mechanical and electrical engineers, brass and iron founders, smelters, etc. Cap.: £5,000. Dirs.: F. St. J. North and D. J. W. Boag.

Foray Ltd. Heating, lighting, refrigeration, drying and ventilating engineers, etc. Cap.: £100. Dirs.: to be appointed by subscribers. Subs.: K. D. E. Oakley and H. S. Warbey, 31/2 Broad St. Avenue, E.C.2.

Gordon Hughes Electrical Co., Ltd., 861 Stratford Rd., Hall Green, Birmingham. To take over business carried on by Gordon Hughes Electrical Co., Ltd. (in liquidation), electrical contractors and engineers, etc. Cap.: £100. Dirs.: J. P. Long and Dorothy E. Raine.

G. L. Headley Ltd., 110 St. Georges Rd., Bolton. To take over business of wholesale electrical dealer carried on as "G. L. Headley" at Bolton. Cap.: £10,000. Dirs.: G. L. Headley and W. R. Baker.

A. M. Lock and Co., Ltd., Crompton St., Chadderton, nr. Oldham. To take over business of industrial, electronic and electro mechanical engineers carried on at Chadderton, Oldham, by A. M. Lock, E. P. Beverley and H. A. Tapsfield as A. M. Lock and Co. Cap.: £1,000. Dirs.: M. A. Lock, E. P. Beverley and H. A. Tapsfield.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Ancolite. 710,735. Class 7. Electricity generators. Allied National Corpn., Ltd., Anco House, Buckingham Gate, S.W.1.

Erodomatic. 710,358. Class 9. Electrical apparatus for use in working metals. Wickman Ltd., Banner Lane, Tile Hill, Coventry.

Flame Thrower. B709,239. Class 11. Vehicle electric lamps. Joseph Lucas Ltd., Great King St., Birmingham 19.

PRICE OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	285 0 0	—
LEAD, good soft pig (foreign)	92 0 0	112 0 0
" " " "English" quality ...	93 10 0	
TIN (99·99.76%) ... ... (Cash)	964½-966	—
" (3 months)	955½-956½	—
ALUMINIUM, commercial purity (del.)	166 0 0	—
ZINC	110 0 0	100 0 0
ARMOURING:		
Galv. Steel Wire (0.104 in.) ...	53 0 0	—
Mild Steel Tape (0.04 in.)	39 15 0	—

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Artistic Enterprises Ltd. Resolution for voluntary winding-up passed at meeting on Nov. 13. Leonard C. Curtis, 15 Gt. Marlborough St., London W.1, was appointed liquidator, to whom creditors are asked to send particulars by Dec. 15.

Brightglow (Cardiff) Ltd. The liquidator, T. J. M. Macleod, of 4 Bucklersbury, London E.C.4, released as from Oct. 22.

Clifton Electrical Services Ltd. Meeting of creditors will be held at Y.M.C.A., Warwick Rd., Coventry, at 3 p.m., today Thursday.

Dudley Electrical (Wholesale) Supplies Ltd., of Dudley, Worcs. Winding-up order dated Nov. 17.

George Douglas and Co., Ltd., Newcastle. Last day for receiving proofs in respect of intended payments to preferential creditors, Dec. 3. Liquidator is R. F. Howe, Official Receiver, 54 Westgate Rd., Newcastle.

Power Lines Construction Co., Ltd. Meeting of members will be held at 8 Queen St., Cheapside, E.C.4, on Dec. 30, at 12 noon, to receive liquidator's report.

Voluntary Liquidation

I. and W. Rockall Ltd., electrical engineers. Resolution for voluntary winding-up passed at meeting on Nov. 6. At subsequent meeting of creditors statement of affairs disclosed liabilities of £1,025. Assets of book value of £1,103 estimated to realise £740 and after deducting £11 due to preferential creditor, there were net assets of £729, or deficiency, as regarded creditors of £296. Issued share capital was £100 and, so far as the contributories were concerned, there was total deficiency of £396. Resolutions passed confirming voluntary liquidation with N. W. Osborne, C.A., of 11/12 Finsbury Sq., London E.C.2, as liquidator, with a committee of inspection.

A. W. Fisher and Sons (Ipswich) Ltd., electrical engineers, Ipswich. At meeting of creditors statement of affairs submitted showing liabilities of £5,380, of which £3,714 was due to trade creditors, and £1,666 in respect of cash loans. Assets amounted to £1,254 and after allowing £46 for preferential claims, there were net assets of £1,208, or deficiency as regarded creditors of £4,172. Issued share capital was shown at £600 and, so far as the members were concerned, there was total deficiency of £4,772. Creditors passed resolution confirming voluntary liquidation with R. A. Paterson, C.A., of 45 Princes St., Ipswich, as liquidator, with a committee of inspection.

BANKRUPTCY ACTS

Appointment of Trustee

Brentford. Lionel J. Quick, electrical distributor of 2 The Mall, Ealing, Middx. Trustee is Robert A. Rodgers, Corp. Acc., 25 Bedford Row, W.C.1.

Receiving Orders

London. Sydney I. Chapman, electrical agent trading as S. Chapman and Co., at 103 Endsleigh Court, London. Date of receiving order, Nov. 12.

Birkenhead. R. Williams, trading as electrical engineer at 33a Beech Rd., Higher Tranmere, Birkenhead. Date of order, Nov. 12.

Intended Dividend

Rochdale. Jack Hilbert, radio and electrical engineer, of 17 Manchester Road, Haslingden, Rossendale. Last day for receiving proofs, Dec. 5. Trustee is A. T. Eaves, 47 Mosley St., Manchester.

BUSINESS PROSPECTS

HOME

Aberdeen. Approval granted for erection of 171 houses at Garthdee for Scottish Co-operative Housing Association.

Ayr. Dean of Guild Court has approved plans for 38 houses on Craigie estate.

Battle (Sussex) R.D.C. It is proposed to erect 60 houses on Lr. Almonry Farm site.

Beverley (Yorks.) R.D.C. Erection of 52 houses at Woodmansey and 8 at Lund. G. Palfreyman, 36 Market Place.

Bolton. S. J. Stephenson and Gillis, 2 Saville Chambers, North St., Newcastle, are architects for reconstruction of shop premises for Joan Barrie Ltd.

Cheshire. Approval granted to inclusion of schemes costing £956,838 in next year's building programme. It includes four primary schools, two secondary schools, a grammar school and first stages of Hartford and Sale colleges of further education.

Chesterton (Camb.) R.D.C. Fifty houses to be built at Bourn, 174 at Gt. Shelford, 20 at Horningsea and 8 at Harton.

Colchester T.C. Erection of 66 houses (instead of 102 flats) on Shrub End estate, has been approved.

Corby. Development Corp. invites submission of names in connection with 300 houses and 12,000 sq ft factory. R. F. Brooks Grundy is general manager, The Stone House, South Road.

Daventry T.C. Further 68 houses to be built on Dryden Ave. site.

Easington (Dur.) R.D.C. Permission to borrow £1,235 being sought for installation of one additional power point in each of 650 houses.

Eston U.D.C. Further 80 houses are to be built on five estates in district.

Gateshead. Additions are to be made to factory on Team Valley Estate for N.-Eastern Trading Estates Ltd.

Hastings T.C. Tenders will probably be invited shortly for erection of 12 houses and 36 flats on Gale Farm estate.

Huyton-with-Roby U.D.C. Revised plans approved for completion of St. John's Rd. east estate, including 564 houses and flats.

Kent. Lighting improvements to be carried out in Old Court House which is to become part of Nonington College of Physical Education.

London. Planning consent given to erection of offices in Cheapside for Bank of England.

Lyme Regis. Fifty dwellings to be erected at Summerhill.

Mitcham T.C. Plans approved for 102 maisonettes on Baron House estate.

Newport (Mon.). Completion of St. Julian's High schools, and provision of primary school at Brynglas included in next year's building programme.

Rochester. Council proposes to erect 122 houses on St. Williams Way estate, 61 in Breton Rd., 148 in Windmill Rd., Strood, and 120 adjoining Valley View estate.

Rugby T.C. Plans going ahead for proposed Abbotts Farm site providing for some 750 dwellings.

Southend. Layout plans approved for 350 dwellings at Shoebury.

Stalybridge T.C. Construction of 90 houses and 24 flats on Stamford Park estate. Howard and Benson, architects, 88 Mosley St., Manchester.

Suffolk. Erection of new fire station at Clare. Fire Authority's architect is E. J. Symcox, County Hall, Ipswich.

Tyrone. Tenders to be invited soon for erection of grammar school at Cookstown.

Welwyn Garden City U.D.C. Erection of 245 houses and 24 flats in scheme No. 16. Council's architect is C. W. Fox, 22 Parkway.

West Bromwich T.C. Application to be made for sanction to borrow £49,364 for second stage of Yew Tree primary school.

OVERSEAS

Canada. U.K. source of supply of a thousand ¼ h.p. electric motors sought by Motor Coach Industries, Ltd., St. Matthews and Erin, Winnipeg. Inquiries to Mr. Quinn direct.

TRADE NOTES

Indian Import Policy. Under new import quotas for the second half of the current year the quota for radio components has been reduced from 50% to 10% for both hard and soft currency areas, and from 100%, soft only, to 20%, soft.

Change of Title. The name of Airmec Laboratories Ltd., has been changed to Airmec Ltd. The firm is still operating from High Wycombe.

New Branch. Siemens Electric Lamps and Supplies Ltd. are opening new premises at Siemens House, Bath Road, Brislington, Bristol, on December 8, where stocks of all materials will be available. For the last 11 years the firm has utilised temporary premises at 18 Downleaze, Stoke Bishop.

Branch Office. The Telegraph Construction and Maintenance Co. Ltd. will open a branch office on December 1, at 43 Fountain Street, Manchester 2 (Tel.: Central 0758), under the charge of Mr. J. Taylor.

Beama Contract Price Adjustment Formulae. *For Electrical Machinery and Equipment.* For purposes of calculating variations in: (a) "Rates of Pay"—the rate of pay for adult male labour at November 10, 1952, shall be deemed to be 141s. 6d., (b) "Cost of Material"—the index figure for Materials used in the electrical machinery industries published in the Board of Trade Journal on November 15, 1952, is 166·6.

For Turbo-Generating and Allied Plant. For purposes of calculating variations in: (a) "Rates of Pay"—the rate of pay for adult male labour at November 10, 1952, shall be deemed to be 141s. 6d. (b) "Cost of Material"—the index figures published in the Board of Trade Journal on November 15, 1952, are: Materials used in Mechanical Engineering Industries—150·6 "Blast Furnaces and Iron and Steel Melting and Rolling (40 and 41)"—142·5. The price of brass condenser tubes ¾ in. o/d. 18 SWG published in The Metal Bulletin on November 21, 1952, is 3s. 11¾d.

For outstanding Contracts covered by the B.o.T. Intermediate Products Index. For purposes of calculating variations in: (1) "Rates of Pay"—the rate of pay for adult male labour at November 10, 1952, shall be deemed to be 141s. 6d. (b) "Cost of Material"—the index figure for Intermediate Products, published in the Board of Trade Journal on November 15, 1952, is 359·8.

MEETINGS TO NOTE

THURSDAY, NOV. 27

I.E.S. (Birmingham Centre).—"Lighting of Docks and Railway Marshalling Yards." W. T. F. Souter. Regent House, St. Philip's Place, Colmore Row, 6 p.m.

FRIDAY, NOV. 28

INST. OF WELDING (N. London Branch).—First annual dinner at Holborn Restaurant, London, 6.45 p.m.

MANCHESTER ASSOC. OF ENGRS.—"Economic Review." A. Elliott. Engineers Club, Albert Sq., 6.45 p.m.

INCORP. PLANT ENGRS. (Birmingham Branch).—Ladies' evening. "Domestic Use of Fuel." J. Nixon.

INCORP. PLANT ENGRS. (Peterborough Branch).—Annual dinner.

I.E.S. (Swansea Group).—Annual supper dance.

I.E.E. (Swansea sub-centre).—Annual dinner and dance and visit of President. Langland Bay Hotel, 7 p.m.

SATURDAY, NOV. 29

I.E.E. (N. Lancs sub-centre).—Dinner dance at Cliffs Hotel. Blackpool, 6.30 p.m.

MONDAY, DEC. 1

A.S.E.E. (N.E. London Branch).—"General Installations." H. W. Quelch. Angel Hotel, Ilford, 8 p.m.

SOC. OF ENGINEERS.—"Fatigue of Metals: Facts and Theories." B. R. Byrne. Burlington House, W., 5.30 p.m.

I.E.E. (Merseyside and N. Wales Centre).—Discussion on "Impact of TV on Sound Broadcasting." G. Parr. Liverpool Royal Instn., Colquilt St., 6.30 p.m.

I.E.E. (N.E. Radio and Measurements Group).—"Harmonic Response Testing Apparatus for Linear Systems." D. O. Burns and C. W. Cooper. King's College, Newcastle, 6.15 p.m.

I.E.E. (S. Midland Centre).—"Colour Television: Some Aspects of Colour Rendering." G. T. Winch. Joint meeting with Radio Group. James Watt Memorial Inst., Great Charles St., Birmingham, 6 p.m.

I.E.E. (Norwich).—"275 kV Developments on British Grid System." D. P. Sayers and J. S. Forrest. Royal Hotel, 7.30 p.m.

I.E.E. (Reading).—"275 kV Developments on British Grid System." F. J. Lane. Elect. Offices, Market Place, 7 p.m.

E.P.E.A. (London Tech. Group).—Discussion on "Power Station Troubles." Caxton Hall, Westminster, 7 p.m.

TUESDAY, DEC. 2

A.S.E.E. (W. London Branch).—"Ductube System in Structures." Windsor Castle Hotel, King St., Hammersmith, 7.30 p.m.

A.S.E.E. (S.E. London Branch).—"The Camera in Industry." Eltham Congregational Church Hall, Court Rd., Eltham, 8 p.m.

A.S.E.E. (Nottingham Branch).—"Power Factor Correction." G. Knights. Elect. Showroom, Smithy Row, 7.30 p.m.

PURCHASING OFFICERS ASSOC. (Darlington Group).—"Ordering Systems." Discussion. Imperial Hotel, 7.30 p.m.

PURCHASING OFFICERS ASSOC. (Liverpool Branch).—"Buying and Stores Control Procedure." B. G. Owen. Mitre Hotel, Dale St., 7.30 p.m.

INCORP. PLANT ENGRS. (London).—"Steam versus high pressure hot water installations." B. Pheasant. Royal Soc. of Arts, John Adam St., W.C.2, 7 p.m.

I.E.E. (London Students Section).—Discussion evening at Public Library, Chelmsford.

I.E.E. (London Measurements Section).—Discussion on "Recording Instruments." W. Bamford. Savoy Place, 5.30 p.m.

I.E.E. (N. Midland Centre).—Discussion on "Technique of Teaching." A. Machennan. Huddersfield Training College, Queen St. South, 6.30 p.m.

I.E.E. (N.W. Centre).—"Electronic Telephone Exchanges." T. H. Flowers. Engineers' Club, Albert Sq., Manchester, 6.15 p.m.

I.E.E. (S.W. Scotland sub-centre).—"C.I.G.R.E. Conference in Paris, 1952." A. S. Husbands and W. L. Kidd. 39 Elmbank Crescent, Glasgow, 7 p.m.

INSTN. OF ENGRNG. INSPECTION (Coventry).—"Marine Radar." M. J. Millane. Technical College, 7.30 p.m.

INSTN. OF ENGRNG. INSPECTION (S. Western Branch).—"Testing Metals." A. D. Mallon. Grand Hotel, Broad St., Bristol, 7.30 p.m.

WEDNESDAY, DEC. 3

A.S.E.E. (N. London Branch).—"Jet Engines." A. C. Parkes. Three Jolly Butchers Hotel, Wood Green, 8.15 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (London).—"School Heating Research." J. C. Weston. Instn. of Mechanical Engrs., Storey's Gate, S.W.1, 6 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (East Midlands Branch).—"Fuel and Firing Appliances." D. C. Gunn. Leicester College of Technology, 6.30 p.m.

INCORP. PLANT ENGRS. (Southampton Branch).—"High-speed Diesel Engines in Mobile Plant." A. V. Driver. Polygon Hotel, 7.30 p.m.

I.E.E. (London Radio Section).—"Thermionic Emitters." D. A. Wright. Savoy Place, W.C.2, 5.30 p.m.

I.E.S. (Edinburgh Centre).—"Vision and Illumination." A. Mellick. 357 High St., 7 p.m.

I.E.S. (Newcastle Centre).—"Brightness Engineering." W. Robinson. Minor Durrant Hall, Oxford St., 6.15 p.m.

I.E.E. (Tees-side sub-centre).—"Post-Graduate Activities in Electrical Engineering." W. J. Gibbs, D. Edmundson, R. G. A. Dimmick and G. S. C. Lucas. Cleveland Scientific and Technical Inst., Middlesbrough, 6.30 p.m.

I.E.E. (N. Scotland sub-centre).—Chairman's address by L. B. Perkins. Caledonian Hotel, Inverness, 7.30 p.m.

I.E.E. (S.E. Scotland sub-centre).—"Electrolytic Analogue in Design of H.V. Power Transformers." D. McDonald. Heriot-Watt College, Edinburgh, 7 p.m.

I.E.E. (Rugby sub-centre).—"Electricity in Newspaper Printing." A. T. Robertson. College of Technology and Arts, 6.30 p.m.

I.E.E. (Southern Centre).—"Logical Approach to Problems of Electric Space-Warming." D. H. Parry. Municipal College Extension, Anglesey Rd., Portsmouth, 6.30 p.m.

I.E.E. (S. Western sub-centre).—"Economics of L.V. Supplies to new Housing Estates." F. G. Copland. Elect. Offices, Taunton, 3 p.m.

INSTN. OF ENGRNG. INSPECTION (Birmingham).—"Application of Electronics in Inspection Methods." J. R. Cornelius. Chamber of Commerce, New St., 7.30 p.m.

THURSDAY, DEC. 4

E.P.E.A. (Merseyside Tech. Group).—"Thermal Problems in Cable Design, Manufacture and Operation." J. Temple Hazel. Elect. Showroom, Whitechapel, Liverpool, 7 p.m.

INCORP. PLANT ENGRS. (Peterborough Branch).—"Modern Dairy Plant." C. H. Maguire. Gas Board, Church St., 7.30 p.m.

I.E.E. (London).—"Overhead Equipment for d.c. Railway Electrification." A. J. Crompton and G. A. Wallace. Savoy Place, W.C.2, 5.30 p.m.

I.E.S. (Glasgow Centre).—"Vision and Illumination." A. Mellick. 39 Elmbank Crescent, 6.30 p.m.

I.E.S. (Nottingham Centre).—"Street Lighting Practice." J. Woodhouse. Elect. Board, Smithy Row, 6 p.m.

I.E.S. (Bradford Group).—"Illumination and Illusion." P. Hartill. Yorks Board, 45-53 Sunbridge Rd., 7.30 p.m.

I.E.S. (Exeter Group).—"Architect's Approach to Artificial Illumination." R. G. Cox. Providence Hall, Northernhay St., 7 p.m.

BRITISH INSTN. OF RADIO ENGRS. (Scottish Section).—"London to kirk o'Shotts TV Cable/Radio Link System." J. H. H. Merriman. University, Edinburgh, 7 p.m.

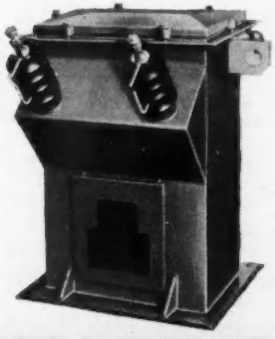
INSTN. OF ENGRNG. INSPECTION (London).—"Gas Turbine: Present Position and Prospects." A. W. Pope. Royal Soc. of Arts, John Adam St., W.C.1, 6 p.m.

EXHIBITION DIARY

Smithfield Show and Agric. Machinery Exbn. opens at Olympia, London, on Dec. 8, continuing until Dec. 12.

HACKBRIDGE
TRANSFORMERS

One of two 3-phase 132/66/11kV. Hackbridge Transformers at a substation in Australia



HACKBRIDGE Transformers are backed by long and varied experience in the design and manufacture of transformers of every type, size and voltage — for supply, distribution and industrial applications. Also on-load voltage regulating equipment, reactors, arc-suppression coils and high-grade instrument transformers.

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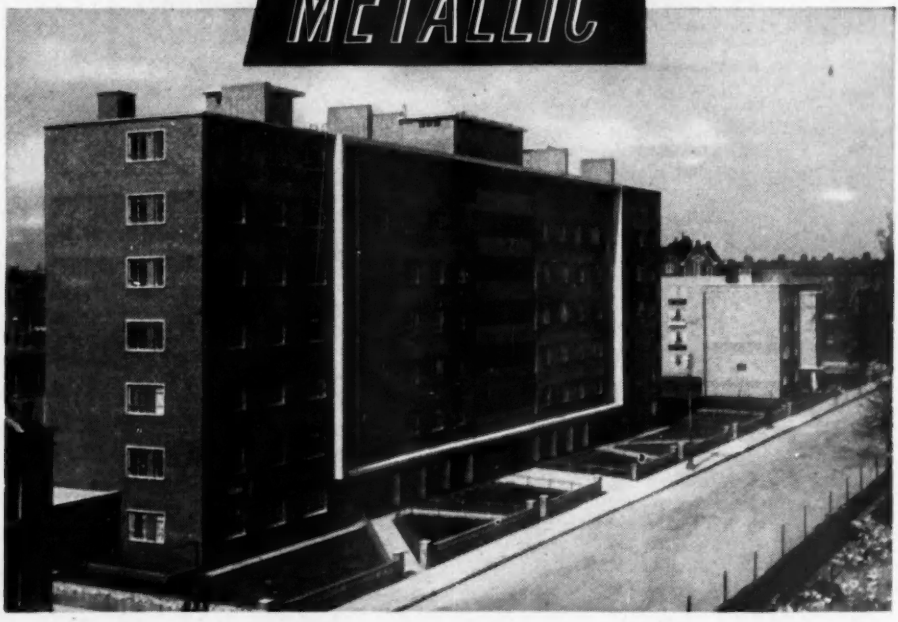

Godwin House, St. Marys Estate, Shoreditch.

(With acknowledgement to Shoreditch Borough Council and Iverson Electrical, Ltd.)

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It may be a school, it may be a factory—a power station or a housing estate, but more often than not the electrical specification will be—METALLIC.

This new block of flats is no exception, being fitted throughout with METALLIC conduit and fittings—unequalled for quality and consistent accuracy.

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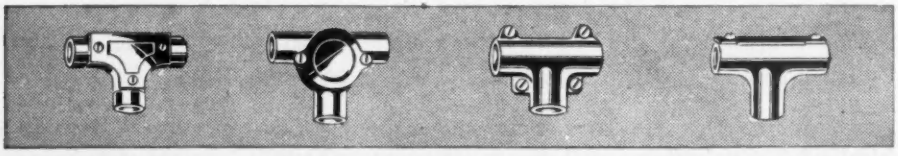

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CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WORK WANTED WANTED · FOR SALE

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

BOROUGH OF WIDNES

STREET LIGHTING

TENDERS are invited for the SUPPLY, ERECTION and FIXING of 1·21 miles of street lighting to conform to the general requirements of the Ministry of Transport Departmental Committee's Final Report on Street Lighting, in particular to the lighting of traffic roads (Group A).

Plans and General Conditions of Contract may be seen and copies of the Specification, Form of Tender and Schedule of Prices obtained on application to the Borough Engineer and Surveyor, Town Hall, Widnes.

Tenders are to be addressed to the Town Clerk, Town Hall, Widnes, and delivered to his office not later than first post on Thursday, December 11, 1952, enclosed in the envelope provided, endorsed "Tender for Street Lighting."

FRANK HOWARTH,
Town Clerk.

Town Hall, Widnes.
November, 1952. (B 566)

BOROUGH OF MALDEN AND COOMBE

Borough Engineer's Department

GROUP "A" STREET LIGHTING
Coombe Lane and Traps Lane

THE COUNCIL invite tenders for the SUPPLY AND ERECTION of street lighting columns complete with lanterns for the above scheme. Tenders to be submitted for the following alternatives:—

1. 68 high-pressure mercury vapour lamps mounted on either ordinary or pre-stressed concrete columns.

2. 74 sodium discharge lamps mounted on either ordinary or pre-stressed concrete columns.

Form of tender, specification and plans may be obtained on application to John Apse, Borough Engineer, Municipal Offices, New Malden, Surrey. Tenders, enclosed in envelopes provided, should reach the undersigned not later than 5 p.m. on December 12, 1952.

HAROLD E. BARRETT,
Town Clerk.

Municipal Offices,
New Malden, Surrey.
November, 1952. (B 665)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Lochaber Area

LINESMAN required for Morar district, rate of pay and conditions of service in accordance with N.J.I.C. for electricity supply industry. House available at Mallaig. —Applications, stating age and full particulars of experience, to Area Manager, North of Scotland Hydro-Electric Board, Area Office, Bank Street, Fort William. (B 666)

CROWN AGENTS FOR THE COLONIES

INSPECTOR OF WORKS (ELECTRICAL), Takoradi Harbour Extensions, required for the Gold Coast Local Civil Service for one tour of 12 to 18 months in the first instance. Salary according to age and experience in consolidated scale, £955 a year rising to £1,180 a year, with a gratuity on satisfactory completion of final service at the rate of £25 or £37/10/-, according to salary for each completed period of 3 months' service. Outfit allowance £60. Free passages. Liberal leave on full salary. Candidates must have served a regular apprenticeship with a reputable firm of electrical engineers and have had subsequent contract experience on general installation, substation and distribution network.

Apply at once, by letter, stating age, full names in block letters, and full particulars of qualifications and experience, and mentioning this paper to the Crown Agents for the Colonies, 4 Millbank, London S.W.1, quoting on letter M.29674B. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (B 645)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

GENERAL ASSISTANT ENGINEER required in the System Operation Department at Divisional Headquarters, Birmingham. N.J.B. service conditions, superannuable appointment. Salary within Schedule "C", Grade 8, £461 to £619, ultimately rising to £694.

Duties are of a general statistical and technical nature associated with the group operation of power stations, and the successful applicant will be required to carry out shift duties as necessary in the System Control Room. Higher National Certificate in electrical engineering or equivalent qualifications required, and preferably graduate membership of the Institution of Electrical Engineers. Experience in a power station will be an advantage.

Application forms available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham 13, to be completed and returned not later than December 6, 1952.

F. W. LAWTON,
Divisional Controller.
(B 653)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following Superannuable appointments. National Joint Board salaries and conditions.

JUNIOR ENGINEER
Cliff Quay Generating Station
Salary, Class "K," Grade 19, £375.—Grade 15, £524.

JUNIOR ENGINEER
Little Barford Generating Station
Salary, Class "G," Grade 16, £375—Grade 14, £471.

Commencing salary depending on qualifications and experience.

The duties of the successful applicants will include assisting in the control room on shift and other operation and investigation duties. Preference will be given to applicants who have had previous experience in a generating station and who have reached the standard of the Ordinary National Certificate in Electrical Engineering or its equivalent.

Applications stating age, qualifications and experience, should be sent to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, by December 6, 1952.

W. N. C. CLINCH,
Controller.
(B 637)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following post in the Construction Department of this Division:—

SECOND ASSISTANT ENGINEER (ELECTRICAL)
Staff Vacancy No. 100/52.

Applicants should hold a degree in electrical engineering, be Corporate Members of the Institution of Electrical Engineers, or possess other equivalent qualifications.

They should have had experience in the design and installation of turbo-alternators, switchgear, transformers and cables up to 33 kV, and other electrical equipment associated with modern power stations.

Experience in the preparation of specifications and estimates is essential.

Salary will be within Schedule "C", Class "AX/DX", Grade 2 (£834 to £1,053 per annum) of the National Joint Board Agreement.

The post will be pensionable within the provisions of the Authority's superannuation scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and returned, not later than December 8, 1952, to the undersigned. Please quote vacancy number.

FIRST ASSISTANT ENGINEER
Generation Operation.
Staff Vacancy No. 102/52.

Applications are invited from suitably qualified engineers for the above position on the staff of the Generation Engineer (Operation), Northern Group, located at Nottingham, or Generation Engineer (Operation), Southern Group, located at Leicester.

Appropriate technical qualifications to at least Higher National Certificate standard is desirable, and applicants should have served a recognised engineering apprenticeship. Experience subsequent to training must include power station operation and maintenance, preferably in a responsible position.

Salary will be in accordance with N.J.B. Agreement, Schedule "C", Class "AX", Grade 1 (£970 to £1,103 per annum).

The post will be pensionable within the provisions of the B.E.A. and Area Boards' Superannuation Scheme.

Applications should be submitted on the official form, which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned to the undersigned not later than December 8, 1952. Please quote Vacancy No. 102 when applying for application form.

L. F. JEFFREY,
Divisional Controller.
(B 651)

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

Croydon "A" and "B" Power Stations

ASSISTANT ENGINEER (MECHANICAL PLANNING). Successful applicants will be responsible for the planning of mechanical plant maintenance and associated labour. Practical experience of power station layout, operation and maintenance essential. Class "K", Grade II, £690 18s.

Croydon "A" Power Station

ASSISTANT ENGINEER (MECHANICAL INSPECTING). Successful applicants will be responsible for the inspection of all mechanical plant during maintenance, assessing extent of work and preparation of reports on defective plant and maintenance of records. Class "F", Grade II, £554 8s. per annum.

N.J.B. conditions of service for both positions. Salaries quoted include London Allowance.

Applications on forms obtainable from Station Superintendent, Croydon "B" Power Station, Beddington Farm Lane, Purley Way, Croydon, Surrey, to arrive by December 13, 1952. (B 647)

SOUTH WALES ELECTRICITY BOARD

REQUIRED, SENIOR ASSISTANT (INDUSTRIAL SUPPLY), in the Commercial Department of the Central Sub-Area of the Board at Cardiff.

The duties involved include the negotiation of important supplies to industry, general development of the industrial load and advice to industrial consumers upon utilisation of electricity.

Salary in accordance with Class "L," Grade 4 (£1,140/£1,165/£1,191) of the N.J.B. schedule.

Applications, stating age, present position and salary, qualifications and experience, and giving three referees, to be addressed to the Secretary, to arrive by December 10, 1952.

D. G. DODDS,
Secretary.
St. Mellons, Cardiff. (B 655)

YORKSHIRE ELECTRICITY BOARD

No. 4 (Leeds) Sub-Area

APPLICATIONS are invited for the following appointment:—

SECOND ASSISTANT ENGINEER
(Meters, Testing and Protection)

Applicants should have had experience in the commissioning of new equipment in large substations, and of routine testing and maintenance of protective gear.

Ability to calculate fault levels and grade protection is essential.

The successful candidate may be required to undertake standby duties for fault location purposes.

Corporate Membership of the Institution of Electrical Engineers or exempting qualification will be an advantage.

Salary, N.J.B., Class "K," Grade 7. £844 to £881 per annum.

Applications, giving full details of age, qualifications and experience, should be forwarded to the Manager No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, Leeds, not later than December 11, 1952. (B 638)

BRITISH ELECTRICITY AUTHORITY

South West Scotland Division

THIRD ASSISTANT ENGINEER

A THIRD Assistant Engineer is required in the Transmission Construction Department at Divisional Headquarters, Glasgow. The salary will be within the range £629 to £810.

Applicants should have qualifications up to Graduate I.E.E. standard and have experience of e.h.v. switchgear and transformers. Duties will include supervising the erection of substation equipment and checking contract drawings.

Applications, on Form AE6, which may be obtained from the Authority's Headquarters or from any Divisional office of the Authority, should be forwarded to the Divisional Secretary, 168 Broomhill Drive, Glasgow W.1, within 14 days. (B 631)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

THIRD ASSISTANT ENGINEER (PLANNING AND DEVELOPMENT) required at the No. 3 Sub-Area Headquarters of the Board in Chester. Salary, £621 to £648 p.a. (N.J.B. H/10).

Applicants must have had experience in the design, construction and operation of h.t. and l.t. distribution networks, including substations and switchgear, and they should have obtained at least the Higher National Certificate in Electrical Engineering or an equivalent qualification.

The appointment is superannuable and subject to medical examination.

Applications forms obtainable by written request from the Manager, No. 3 Sub-Area, Electricity House, Newgate Street, Chester, quoting reference 67A. Closing date: December 9, 1952. (B 630)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

STATION ASSISTANT SHIFT CONTROL ENGINEER required at Stourport "A" and "B" Generatirg Stations. N.J.B. service conditions, superannuable appointment, salary within Schedule "A", Grade J12, commencing at £576 per annum.

Higher National Certificate in electrical engineering required, together with sound technical training and practical experience in the control and operation of steam generating plant and main switchgear.

Application forms available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham 13, to be completed and returned by December 10, 1952.

F. W. LAWTON,
Divisional Controller.
(B 652)

BRITISH ELECTRICITY AUTHORITY

South Western Division

ASSISTANT ENGINEER (EFFICIENCY) required at Portishead "A" Generating Station.

Superannuation scheme. Salary: N.J.B., Class "J", Grade 7: £792 to £828.

Candidates should have had good technical education, be experienced in the operation of a modern generating station equipped with chain grate stokers; be familiar with heat flow, boiler and turbine testing, and compilation of statistical data. Knowledge of the chemistry of combustion desirable.

Application forms, obtainable from the Divisional Secretary, 26 Oakfield Road, Bristol 8, to be returned not later than December 15, 1952. (B 646)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

APPLICATIONS are invited for the following superannuable N.J.B. appointments at the Uskmouth Generating Station:—

1. DEPUTY STATION SUPERINTENDENT, K3 (£1,157-£1,208 p.a.).
2. ASST. MAINT. ENG (ELECT.), K9 (£741-£771 p.a.).
3. ASST. MAINT. ENG. (MECH.), K9 (£741-£771 p.a.).
4. JUNIOR ENGINEERS, K19/15 (£375-£524 p.a.).

The station will eventually be re-classified "L."

Desirable qualifications and experience:—

For 1, corporate membership Institution of Mechanical and/or Electrical Engineers and wide experience in the operation, maintenance and administration of a modern generating station.

2. H.N.C. (Elect.) and experience in power station electrical maintenance.

3. H.N.C. (Mech.) and experience in operation and maintenance of h.p. and l.p. boilers and turbines.

4. Manufacturing works training and H.N.C.

Application forms from Div. Secretary, British Electricity Authority, South Wales Division, Cardiff (Pengam Moors) Airport, Cardiff, to be returned by December 12, 1952. (B 649)

METROPOLITAN WATER BOARD

APPOINTMENT OF
SENIOR ASSISTANT ENGINEER (ELECTRICAL)

APPLICATIONS are invited from corporate members of the Institution of Electrical Engineers for appointment as a Senior Assistant Engineer (Electrical) on the permanent staff. Salary scale £917 by £54 to £1,133 per annum. Maximum age 45 years.

Applicants must have had experience in the design, arrangement, specifying and the assessment of tenders for high tension sub-stations; high tension motors, generators and control gear up to 3,000 h.p.; low tension motors, generators and control gear; and associated wiring and cable work.

A house is available if required, in a good neighbourhood, at an inclusive rental of £125 p.a.

A form of application may be obtained from the undersigned on receipt of a stamped addressed foolscap envelope quoting reference ("B"). W. S. Chevalier, Clerk of the Board, Offices of the Board, New River Head, Rosebery Avenue, London, E.C.1. (B 650)

BRITISH ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following positions:—

S/13.356 ASSISTANT MAINTENANCE ENGINEER (Mechanical)
Earley Generating Station

Applicants should have experience in the maintenance of generating station power plant and be capable of taking control of maintenance staff and supervising turbine and boiler overhauls. Preference will be given to those possessing qualifications leading to corporate membership of a recognised professional Institution. Housing accommodation may be available for the successful applicant.

Salary N.J.B. Grade 8, Class "G," £678-£704.

S/13.357 THIRD ASSISTANT ENGINEER
Generation Engineer (Construction) Department

Applicants should preferably be corporate members of a recognised professional Institution or hold qualifications leading to corporate membership. Manufacturing works experience and practical experience in the mechanical aspects of power station design or construction are necessary.

Salary N.J.B. Grade 5, Class "AX/CX," £649-£835.

S/13.358 CLERICAL ASSISTANT (Female)
Earley Generating Station

Applicants should possess a school certificate or equivalent, be capable of shorthand and typing speeds of at least 120/60 and have had experience in the control of staff. A good knowledge of office routine and modern filing methods is desirable, and previous experience as a senior shorthand typist will be an advantage.

Salary N.J.C. Grade 1, £380-£470.

Application forms, obtainable from P. D. A. Oliver, Divisional Secretary, British Electricity House, 111 High Street, Portsmouth, must be returned by December 10, 1952. (B 648)

BRITISH ELECTRICITY AUTHORITY

North Western Division

VACANCY No. 829. ASSISTANT SHIFT CHARGE ENGINEER, Stuart Street Generating Station. Salary £660/£685 (N.J.B., H.9).

Apply to Establishments Officer, British Electricity House, 825 Wilmslow Road, Manchester 20, before December 6. Quote vacancy number. (B 625)

SOUTHERN ELECTRICITY BOARD

METER ENGINEER

NO. 2 (NEWBURY) Sub-Area Office. Salary N.J.B. Class "E," Grade 5 (£978-£1,021 per annum). N.J.B. conditions of service.

The duties of the post will include responsibility to the Sub-Area Engineer for the administration and control of the sub-area meter testing station and the supervision of the district meter testing station and all meter work throughout the sub-area.

Candidates should be corporate members of the I.E.E. or possess equivalent qualifications. They must have a sound knowledge of all matters relating to meter engineering, including statutory requirements, and must be fully experienced in the operation of modern class "A" stations dealing with all types of a.c. and d.c. meters, demand indicators, instruments, time switches, instrument transformers and protective relays.

ASSISTANT ENGINEER (MAINTENANCE)

Melksham District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class "F," Grade 9 (£567/£609 per annum). N.J.B. conditions of service.

The duties of the post will be to assist the operation and maintenance engineer, principally with the operation and maintenance of h.v. and l.v. overhead and underground distribution systems working at voltages up to 33 000 and to undertake minor mains construction work. Standby duties are involved.

The qualifications required are an approved technical training and experience of similar work, including fault location.

Applications for both the above posts on forms obtainable from the Sub-Area Secretary, 7 Oxford Road, Newbury, and returned to him in envelopes suitably endorsed, not later than December 8, 1952.

SENIOR DRAUGHTSMAN (CIVIL ENGINEERING)

No. 1 (Southall) Sub-Area Office. Salary N.J.B. Schedule "D," Grade 5 (£574/7/-/£683/11/- per annum, inclusive of London Allowance). N.J.B. conditions of service.

Applicants should have had training and experience in building construction and the design of steelwork and reinforced concrete structures, and be capable of preparing drawings, and making calculations.

Applications, on forms obtainable from the Sub-Area Secretary, 2-6 Windmill Lane, Southall, Middlesex, and returned to him in envelopes suitably endorsed not later than December 8, 1952.

The successful candidates will be required to contribute to the B.F.A. and Area Boards' Superannuation Scheme, if eligible. (B 644)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 96/52

APPLICATIONS are invited for the superannuable appointment of STATION SUPERINTENDENT at Tir John Power Station, Swansea. Salary, N.J.B. "H.1" (£1,210-£1,265 p.a.). Applicants should preferably be Corporate Members of the Institution of Mechanical and/or the Institution of Electrical Engineers and should have had considerable experience in the operation, maintenance and administration of a modern generating station, including experience of pulverised fuel.

Application forms obtainable from Div. Secretary, British Electricity Authority, South Wales Division, Cardiff (Pengam Moors) Airport, Cardiff, should be returned by December 5, 1952.

November 17, 1952. (B 626)

SOUTH WALES ELECTRICITY BOARD

REQUIRED, DISTRICT COMMERCIAL MANAGER, in District 223 (Swansea) in the West Central Sub-Area of the Board.

Applicants must have had experience in the application of electricity in all its branches; negotiation of supplies, public lighting and contracting.

Salary in accordance with Class "F", Grade 3 (£887/£906/£925) of the N.J.B. Schedule.

Applications stating age, present position and salary, qualifications and experience and giving three referees to be addressed to the Secretary, to arrive by December 10, 1952.

D. G. DODDS,
Secretary.

St. Mellons, Cardiff. (B 654)

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF METER TESTERS
Crown Street, Preston

RATE OF PAY: 42.5d. per hour. N.J.I.C. Conditions

Applications stating age, training and experience, to Sub-Area Manager, No. 4 Sub-Area, The North Western Electricity Board, 40/41 Lune Street, Preston, by December 6, 1952. (B 639)

PERMANENT & PROGRESSIVE POSTS AVAILABLE

Important interesting work on civil and military aircraft, hydraulic accessories, air conditioning equipment, turbine units, gun control systems, also guided weapons, industrial electronic apparatus.

3	SENIOR DESIGNERS . .	Young men free of National Service (or shortly due release) particularly invited to apply. If of good education, previous experience not essential. Special facilities for junior employees for further technical study.
4	INTERMEDIATE DRAUGHTSMEN	
5	JUNIOR DRAUGHTSMEN .	
6	STRESSMEN	Candidates must hold degree. Previous experience not essential but salary adjusted for previous responsible employment in these fields.
7	MATHEMATICIAN . .	For stress calculating.
8	MATHEMATICIAN . . .	First-class honours or higher degree for work on guided weapon control systems. Knowledge of statistics and noise essential.

Apply in confidence with full details, quoting reference number of post sought, to:—

Personnel Manager,
DE HAVILLAND PROPELLERS LTD.,
Hatfield, Herts.

(B 636p)

AIR MINISTRY requires MECHANICAL AND ELECTRICAL ENGINEERING DRAUGHTSMAN at Cheltenham. Applicants must have experience in preparation of schemes for illumination and electrical equipment of buildings or in electrical distribution H.V. and M.V. Salary £592 to £702 per annum. Starting pay dependent upon age and qualifications. Overtime payable.—Apply stating age, qualifications and previous appointments (with dates) to: Superintending Engineer, Air Ministry Works Directorate, Carrick House, Lypiatt Road, Cheltenham. (B 641)

A LARGE COMPANY, whose products are employed throughout the electrical manufacturing industry, invites applications for the position of JUNIOR TECHNICAL SALES REPRESENTATIVE in the London Area. Applicants should have had a sound technical education, preferably to H.N.C. standard, and apprenticeship with reputable electrical manufacturers or equivalent practical training. Age limit approximately 22-28. Permanent position and ample scope and prospects are offered to a man with initiative and keen interest in commercial work.—Write, giving personal particulars, details of qualifications and experience, and salary required to Box No. 2223, Electrical Times. (B 640)

APPLICATIONS from electrical contracting ENGINEERS are invited who have the necessary technical qualifications to enable them to prepare electrical schemes, primarily for schools, from basic detail. They will be required to handle a project from its inception to finalisation, including full contact with clients, tendering and accounts. Successful applicants may be required to live in the Shropshire area.—Replies, stating total experience, qualifications, age and salary, and if the owner of a car, to Box No. 2225, Electrical Times. (B 657)

ARMATURE WINDERS and FITTERS with repair shop experience. Top rates, 5-day week, bonus, all holidays paid, etc.—The Lewis Electric Company, Moor Works, Blackamoor Lane, Maidenhead, Berkshire. (B 571)

BRATT COLBRAN, LIMITED, invite applications for the position of MANAGER for their Electrical Department. First-class administrative ability and sales connections in the industry essential; knowledge of design and development of new appliances an especial advantage.—Write in first instance to General Sales Manager, Bratt Colbran, Limited, 10 Mortimer Street, London W.1. (B 618)

CAPABLE POWER STATION MAINTENANCE ENGINEER required for service in British West Indies, age 35 to 40. Must have first-class knowledge of diesel electric maintenance, operation and testing. Candidates would be expected to carry out complete overhauls to various types of diesel electric generating plants. The present capacity of the station is approximately 5,000 kW, but additions are being made thereto. Candidates should be of good personality, be socially acceptable and, if married, this qualification applies to wives also. A knowledge of high and low tension electrical equipment is essential and candidates should be able to control and instruct local maintenance and operating staff. Salary (including bonus) £960 per annum, plus furnished quarters. Passage paid.—Applications, giving full particulars of education, training and experience, to Box No. 2203, Electrical Times. (B 600)

CAVENDISH LABORATORY, CAMBRIDGE. An ELECTRICAL ENGINEER is required in connection with the construction of a 400 M.E.V. electron linear accelerator. Duties will include the designing and installation of 100 kVA, 25 kV d.c. power supply, control circuits and other special electrical equipment including pulse modulators. It is anticipated that this temporary appointment will be for three years, and the point of entry in the salary scale £650 to £900 will be in accordance with age and qualifications. Research or development experience is essential.—Applications should be submitted to the Secretary of the Department of Physics, Cavendish Laboratory, Free School Lane, Cambridge, by not later than Saturday, December 13. (B 660)

CHARGEHAND required in the Chelmsford District, Eastern Electricity Board, to take charge of Installation Inspectors and Meter Fixers. Sound practical experience in all classes of electrical installations and knowledge of regulations for electrical equipment of buildings essential. Pay, at present 3s. 11½d. per hour, and conditions of service in accordance with National Agreement.

Applications in writing, stating age, experience and present employment, to District Manager, Eastern Electricity Board, Anchor Street, Chelmsford, Essex. (B 661)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

ELECTRICAL DESIGNER DRAUGHTSMEN

REQUIRED FOR

London office of large consulting engineers. Qualifications are H.N.C. (preferred) or equivalent and 3 years' experience on layout and design of power and lighting schemes for large engineering projects. These appointments carry sickness, pension and life assurance benefits and above average salaries will be offered to capable men.—Applications in writing, detailing qualifications and experience, to:

Box No. 2211, ELECTRICAL TIMES. (B 615p)

DRAUGHTSMEN required for transformer drawing office. Previous experience of power distribution, radio or welding transformers is desirable. Progressive positions are offered to men with initiative in expanding department of large modern works on Merseyside. Housing assistance available for selected applicants.—Reply, giving details of age, experience and present occupation, to Box No. 2227, Electrical Times (quoting Ref. AFA). (B 658)

DRAUGHTSMEN required with experience of light electro-mechanical devices for interesting new development and production drawing office work on domestic appliances and television receivers. Good opportunities for men with imagination and initiative in expanding department of large modern works in N.W. England. Housing assistance available for selected applicants.—Reply quoting Ref. AJEE to Box No. 2233, Electrical Times, giving details of age, experience and present occupation. (B 670)

ELECTRICAL DRAUGHTSMAN required, with some estimating experience, on constructing and factory maintenance.—Apply, Employment Manager, Vickers-Armstrongs Limited (Aircraft Section), Weybridge, Surrey. Applications, with certain exceptions, are subject to the approval of the Ministry of Labour and National Service. (B 632)

ELECTRICAL ENGINEERS/GRADUATES required for consulting engineer's offices at Manchester and Newcastle-upon-Tyne. Salary £500 to £850 depending upon age and experience. Experience on installations in factories, hospitals and public buildings an advantage.—Apply, stating age, experience, qualifications and salary required, to R. W. Gregory and Partners, Cromford House, Cromford Court, Manchester 4. (B 667)

JUNIOR ASSISTANT ENGINEER required in estimating dept. by electrical contractors in London S.W.1 area; experience necessary.—Write details, age and salary required, Box No. 2217, Electrical Times. (B 619)

MAJOR OIL COMPANY require one ELECTRICAL ENGINEERING DRAUGHTSMAN for work in London with possible visits to refineries in U.K. or abroad. Age 25-30 years. Ordinary National Certificate essential and practical experience should include 5 years apprenticeship followed by 3 years in the drawing office engaged on electrical layouts of power station plant, h.v. substations and distribution networks.—Write, giving full details and quoting Dept. M.1871, to Box 6332, c/o 191, Gresham House, E.C.2. (B 659)

PLUMBER JOINTER required for Middle East. Experienced in jointing paper insulated cables, lead covered and armoured, up to 11 kV.—Apply, stating age and experience. Forward copies of testimonials, or state names to whom we may apply, to Box No. 2231, Electrical Times. (B 668)

STOREKEEPER for West End Electrical contractors: able to check and keep stock.—Write Box No. 2153, Electrical Times. (B 453)

THE GENERAL ELECTRIC COMPANY LIMITED
WITTON, BIRMINGHAM

requires Winders for turbo-alternators and large a.c. and d.c. machines. High level earnings and good shop conditions; pension scheme. Housing assistance will be given in approved cases. Apply by letter, giving full details of experience, to:—

The Labour Manager,
THE GENERAL ELECTRIC COMPANY LIMITED
Electric Avenue, Witton, Birmingham 6 (B 555p)

JOHNSON & PHILLIPS LTD.

OVERSEAS APPOINTMENT
FOR
SWITCHGEAR ENGINEER

REQUIRED to develop switchgear manufacture in an existing factory in India.

Applicants must be fully conversant with the manufacture and assembly of switchgear up to 11,000 volts and be competent to plan complete switchgear installations. The immediate problem is the design and construction of switchboards using imported circuit breakers and components.

The appointment is a senior one offering scope for initiative and opening for advancement. Salary will be at a generous level. Suitable provisions for retirement are available. Normal home and local leave arrangements.

Applicants should preferably be 28 to 40 years of age.

Applications, which will be treated in strict confidence, should be addressed to the

Managing Director
JOHNSON & PHILLIPS LTD.
Victoria Way, Charlton
London, S.E.7 (B 627p)

SENIOR DESIGN DRAUGHTSMAN, for prototype electronic equipment. Knowledge of Ministry of Supply requirements an advantage. Ideal working conditions. Canteen and travel facilities.—Apply in writing, giving full particulars, to Furzehill Laboratories Ltd., Evesham Road, Bishop's Cleeve, Nr. Cheltenham. (B 642)

SENIOR TRANSFORMER ENGINEER is required by an old-established electrical manufacturer to take charge of a section designing power transformers up to 10,000 kVA at voltages up to 66 kV in a new factory in the North West. Applicants should be graduates of a British University, Corporate Members of the Institution of Electrical Engineers, and experienced in all the latest techniques of transformer engineering including impulse testing. Arrangements will be made for satisfactorily housing the successful applicant.—Please write, quoting Ref. GBE, to Box No. 2221, Electrical Times. (B 633)

THE BRITISH ELECTRICITY AUTHORITY, Merseyside and North Wales Division, have vacancies for OVERHEAD LINESMEN in the Connah's Quay Section of the Transmission Department. This section is temporarily based at Queensferry and this will be the centre from which linesmen will work.

Preference will be given to men having experience of work on lattice steel towers but applicants without such experience will be considered.

N.J.I.C. conditions. Rate of pay 39.50d. per hour for a 44-hour, 5-day week.

Applications, stating age, experience, past and present employment, to be addressed to Divisional Secretary at Beaconsfield Road, Woolton, Liverpool. Closing date, December 8, 1952. (B 656)

THE NATIONAL BOILER AND GENERAL INSURANCE CO. LTD., St. Mary's Parsonage, Manchester 3, requires ENGINEERS for appointment as Inspecting Engineers of (a) Boilers and Engines, (b) Lifts and Cranes, and (c) Electrical Plant. First-class M.o.T. Certificate of Competency, and/or Higher National Certificate (mechanical or Electrical), full apprenticeship and practical experience necessary.—Apply, in own handwriting, giving age (limits 26 to 33), training and experience, academic qualifications and copies of testimonials. Salary up to £750 per annum. Non-contributory pension scheme. (B 563)

APPOINTMENTS WANTED

CABLE and Wire Manufacture. Branch Manager, South Wales and West England territory (32), requires situation. Sales representation/clerical experience. Electrical knowledge. Current licensed driver. Six years cable industry.—Box No. 2181, Electrical Times. (B 520)

WANTED

£50,000

Immediate cash available for purchase of New Ball and Roller Bearings, all types. Steel Balls and Rollers. Top prices paid. Purchases from Traders only.

CLAUDE RYE BEARINGS

895-921 Fulham Road, London, S.W.6

RENown 6174 (20 lines) (B 254p)

A.C.-D.C. MOTORS, STARTERS, complete change-over installations, etc.—A.A. Electrical Co., Ltd., 67 Rothschild Road, Chiswick Park, W.4. Tel.: Chiswick 5105. (A 11)

MOTORS. Wanted to purchase, D.C. Motors and Generators as fitted to Coles Cranes. Incomplete machines considered.—Box No. 2189, Electrical Times. (B 551)

TWO only. 120 KVA 400 V single-phase POWER FACTOR CONDENSERS.—Full details to Chief Engineer, Reads Ltd., Orrell House, Orrell Lane, Walton, Liverpool 9. (B 628)

WANTED. COLES CRANES, good prices offered.—The Winsland Co., Winsland Street, W.2. Ambassador 2803. (B 662)

WANTED. D.C. and A.C. ball-bearing MOTORS, MOTOR GENERATOR SETS, DYNAMOS and ALTERNATORS.—Full details to Britannia Manufacturing Co. Ltd., 22-26 Britannia Walk, London, N.1. (A 7)

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper Ltd., 176 Brady Street, Bethnal Green, E.1. (A 1)

WANTED. Large quantity of 4-in. outside diameter TUBES from the dismantling of old Babcock water-tube boilers. Best prices paid. Prepared to purchase Babcock and Wilcox water-tube boilers for dismantling. —Apply, giving full details, to Midland Iron and Hardware Co., Cradley Heath, Staffs. (A 3)

WANTED, ROTARY CONVERTORS, any size.—Universal, 221 City Road, London E.C.1. (A 9)

WORK WANTED

A.C. and d.c. MOTOR REWINDS and REPAIRS. Prompt service, fully guaranteed. Edgware 5566 (4 lines). —Service Electric Co. Ltd., Stanmore, Middx. (A 19)

BRASS LIGHTING FITTINGS, cleaned and gilded. Crystal chandeliers repaired and cleaned. Outside lanterns gilded and waterproofed.—Arts and Antiques, 49 Berwick Street, London W.1. (B 393)

CASTINGS. Fisher Foundries Ltd., Greet, Birmingham, have capacity for brass, gunmetal and soft grey iron machine moulded repetition castings weighing 1-30 lb. Loose pattern work up to 3 cwt. Delivery by road to all parts. Tel.: B'ham, Victoria 0197. (A 647)

ELECTRIC motors, stators, etc., REPAIRED AND REWOUND. Vacuum cleaner and electric tools rewound. Seven-day service.—Motor Winding Co., 18 Gipsy Hill, London S.E.19 (Gipsy Hill 0354). (B 575)

METALWORK. All types cabinets, chassis, racks, etc., to your own specifications.—Philpott's Metalworks, Ltd., Chapman Street, Loughborough. (A 352)

AGENCIES

FLUORESCENT TUBE refilling specialists require AGENTS in Yorks, Tyneside, Lincoln, Northampton, Suffolk, Devon and West Wales. Must have facilities for the storing and distribution of tubes.—Qualpron (Elect.), 43 Crawford St., Glasgow W.1. (B 614)

BUSINESS OPPORTUNITIES

CANADA

FIRMS who have well considered plans for starting or expanding manufacture in Canada, and who require financial assistance, are invited to contact an important London Banking House.

All communications, including any initial enquiries, should be in writing, addressed to

"Canada," c/o Slaughter & May

18 Austin Friars, London, E.C.2

(B 629p)

FOR SALE

AUCTION

Removed for convenience of Sale at
4 CONDUIT COURT, LONG ACRE, LONDON W.C.2
on
TUESDAY, DECEMBER 16, 1952 at 11 o'clock.

STOCK OF ELECTRICAL FACTOR AND MANUFACTURER

COMPRISING large quantities bakelite switches, lampholders, junction boxes, roses, plug adaptors, batten holders, flush and surface sockets and other bakelite accessories; 5,000 E.S. lampholders; 1,000 torpedo switches; 10,000 galleries; 1,500 brass lampholders; 2,000 conical shades; reflectors; 800 buzzers; 1,400 iron connectors; 10,000 yards twin cable lead and T.R.S.; 300 watertight inspection lamps; reel insulators; ironclad; 400 irons; 220 hair dryers and other appliances.

Quantities of elements; flexes: wires; cable clips; adhesive tape; bell wires, etc; fluorescent lamps and chokes.

35 ¼ to ½ h.p. motors, by G.E.C. and Brooks; 3 3-h.p. 3-ph. motors; 120 Stanelco wire welders; 70 car accumulators.

180 bubble washers; large quantity unfinished ditto and parts; radio sets; valves and wireless accessories; 25 various test sets by Avo, Weston, etc.; 7 bridge meggers.

Pathovox talkie 9 m/m cinema and films; screens, lenses, theodolite; ship's sextants; 5 portable compressors; cylinders; stock of small compressor parts; buffing and grinding wheels; 100 drill chucks; 120 pressure gauges; 18,000 ft braided motor pump tubing.

2 Chubbs large modern bent steel safes; 2 typewriters; International time recorder; string; paper, etc.

On view day prior, and day of sale. Catalogues of the Auctioneers,

West Central Merchandise Mart, 1 Conduit Buildings, Floral Street, London W.C.2. 'Grams: Loudsigs, Rand, London. 'Phone: TEMple Bar 0233/4. (B 643)

ENGINEERING PLANT & MATERIALS

CONDUIT ex-stock against Licence or S.Q.E. Certificate, close joint or welded, also CONDUIT FITTINGS, CABLE, etc.—Bertford Manufacturing and Supply Company, Marklands Works, Horwich, Lancs. Tel.: Bolton 8093. (B 605)

FOR DISPOSAL: 3/16 in. Whit. Spire Nuts, 250,000.
19/32 in. o.d. x ½ in. i.d. Convex Spring Washers, 20,000.
1 in. x 9/32 in. x 18G M.S. Washers, 50,000.
0·134 in. dia x ¼ in. M.S. Rivets, 80,000.
3/16 in. dia. x ¼ in. Csk. Hd. M.S. Rivets, 5,000.
½ in. o.d. x 13/64 in. bore x 11/32 in. lg. Spacing Bushes, 30,000.
Offers, Box No. 2229, Electrical Times. (B 663)

FOR SALE, electric/hydraulic STACKER TRUCK, pedestrian controlled. Capacity 15 cwt. Rubber-tyred wheels. Price £350. Photo available.—Angel Truck Co., Ltd., 215/9 Albion Road, London N.16. (B 664)

DOMESTIC APPLIANCES

GRUBB IMMERSION HEATERS. The new 7 kW model. No purchase tax. Provision for intermediate loadings as required. All lengths 16 in. to 30 in. Immediate delivery.—Write for particulars and terms to distributors, John Owner and Co., Ltd., Springfield Road, Birmingham 13. Tel.: Springfield 2939. (B 25)

LIGHTING EQUIPMENT

PURLEY CHOKES AND BALLASTS. Our 80 W tapped h.p.f. ballast, with starter switchgear-holder incorporated, is proving itself the most popular unit. Suitable for most fittings. 57s. 6d. each, subject.—F. W. Blanshard Ltd. (Dept. ET), Purley, Surrey. Uplands 4818-9. (A 20)

30,000 OSRAM BULBS, 24 V 3 W M.E.S. 15 m/m. New, suitable for Christmas Lighting Sets, etc. Price 7½d. each nett, tax inclusive. (Ex M.o.S.)—Box No. 2201, Electrical Times. (B 577)

METERS

A.C./D.C. QUARTERLY and SLOT METERS. Brent Electrical Co., 6 Holmdale Gardens, London, N.W.4. (A 8)

HOUSE-SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Road, London E.C.1. (A 14)

MOTORS & STARTERS

A.A. ELECTRICAL CO. FOR A.C./D.C. MOTORS, SWITCHGEAR, EXHAUST FANS, HOISTS, REDUCTION GEARS, new or reconditioned units.—Chiswick 5105, Chiswick 5605, 67 Rothschild Road, W.4. (A 10)

A.C. and D.C. MOTORS, all sizes, large stocks. Fully guaranteed.—Milo Engineering Works, Ltd., Milo Road, East Dulwich, S.E.22. (Forest Hill 2278-9.) (A 5)

A.C. and D.C. MOTORS, GENERATORS, from stock.—Service Electric Co., Ltd., Honeypot Lane, Stanmore, Middx. Edgware 5566-9. (A 13)

A.C. and D.C. MOTORS, GENERATORS, SWITCHGEAR, etc., always in stock. Let me have your inquiries.—G. E. Whittaker, Wellington Mill, Bolton Road, Blackburn. Tel. 7322. (A 6)

ELECTRIC MOTORS FOR 400 V, 3 PHASE, 50 CYCLES. 300 h.p. Auto. Synchronous L.D.M. MOTOR, open protected type on C.I. underbed, 600 r.p.m., with direct coupled exciter and Brookhirst control equipment.

250 h.p. synchronous MOTOR by Verity, speed 750 r.p.m., 340 amps, internal slipring type, protected frame. Rotor volts 1,200 a.c., rotor amps. 190 d.c., with direct-coupled exciter 6 kW, 30 V, including control gear.

Two 260 h.p. slipring INDUCTION MOTORS by Mather and Platt, 587 r.p.m., pipe ventilated frames. Rotor volts 550/610, rotor amps. 215/195. Shaft 8 in. by 3¾ in. dia., including control gear.

225 h.p. S.R. MOTOR by B.T.H., 485 r.p.m., 292 amps, protected type, 2 endshield R.O.B.

175 h.p. external S.R. MOTOR by B.T.H., 480 r.p.m., protected type, 2 endshield R.O.B., standard shaft ext.

150 h.p., 350 kVA Synchronous INDUCTION MOTOR by Mather and Platt, 506 amps, 0·39 p.f., speed 750 r.p.m., with Brookhirst starter.

Two 120 h.p. External S.R. MOTORS by Met-Vick., 585 r.p.m., screen protected type fitted drip-proof cowls, endshield B.R.B., standard shaft ext. 8 in. by 4 in. dia.

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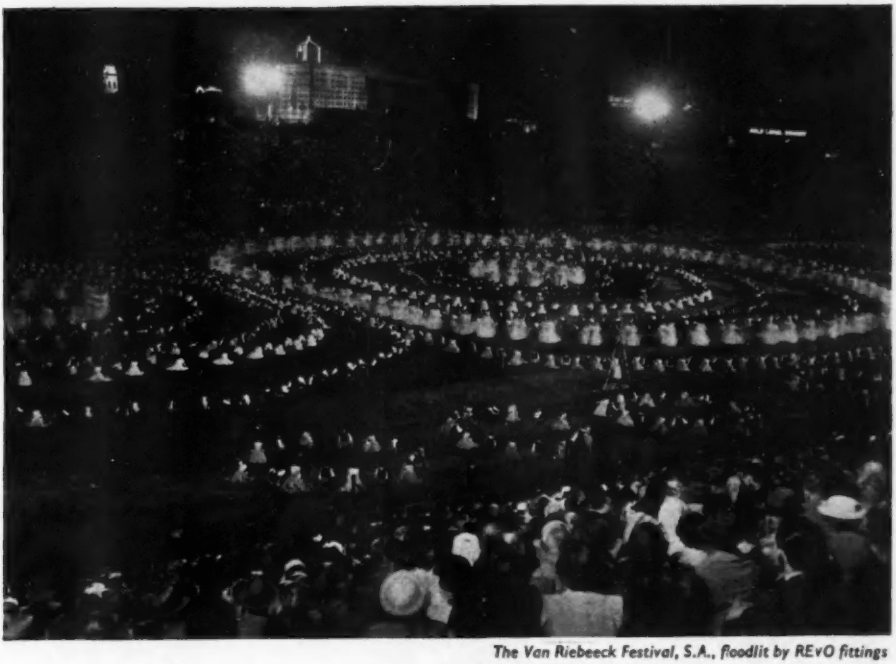

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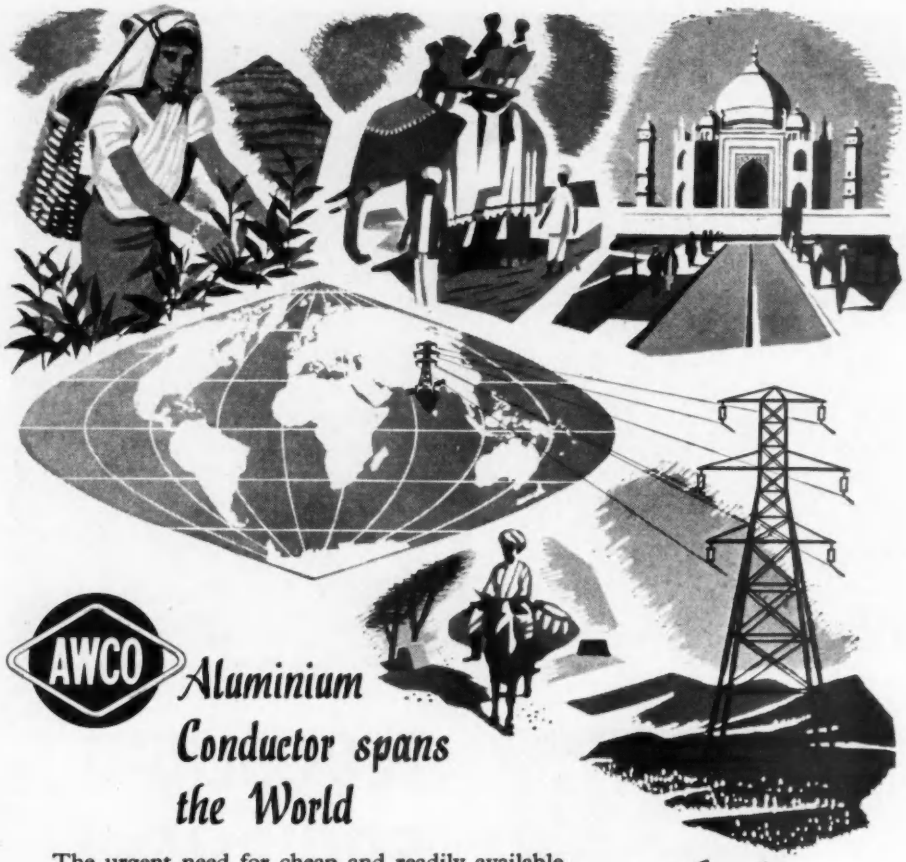

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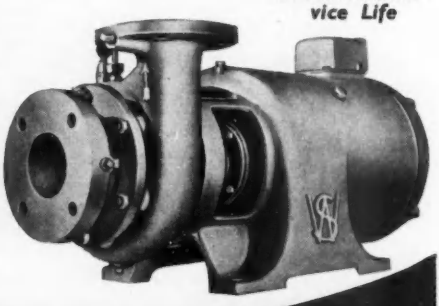

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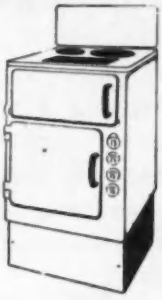

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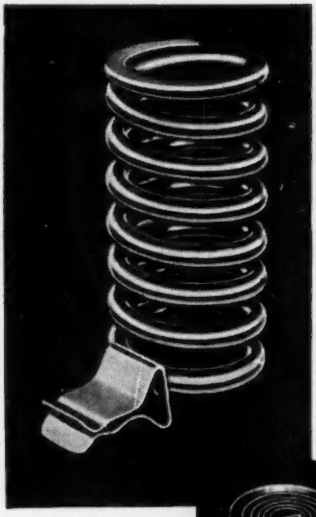

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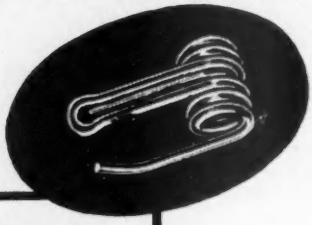

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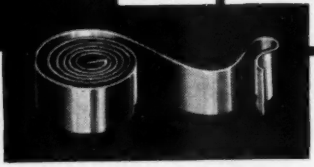

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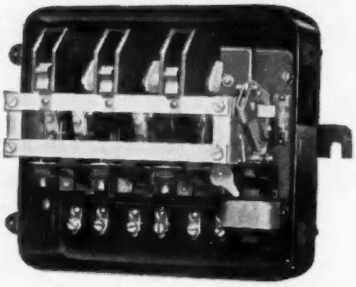

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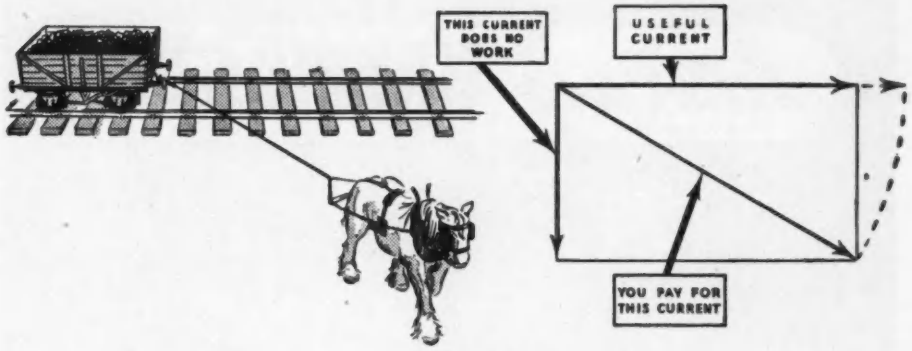

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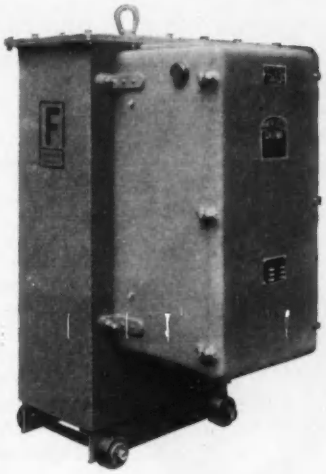

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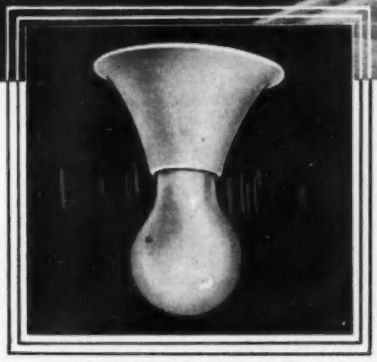

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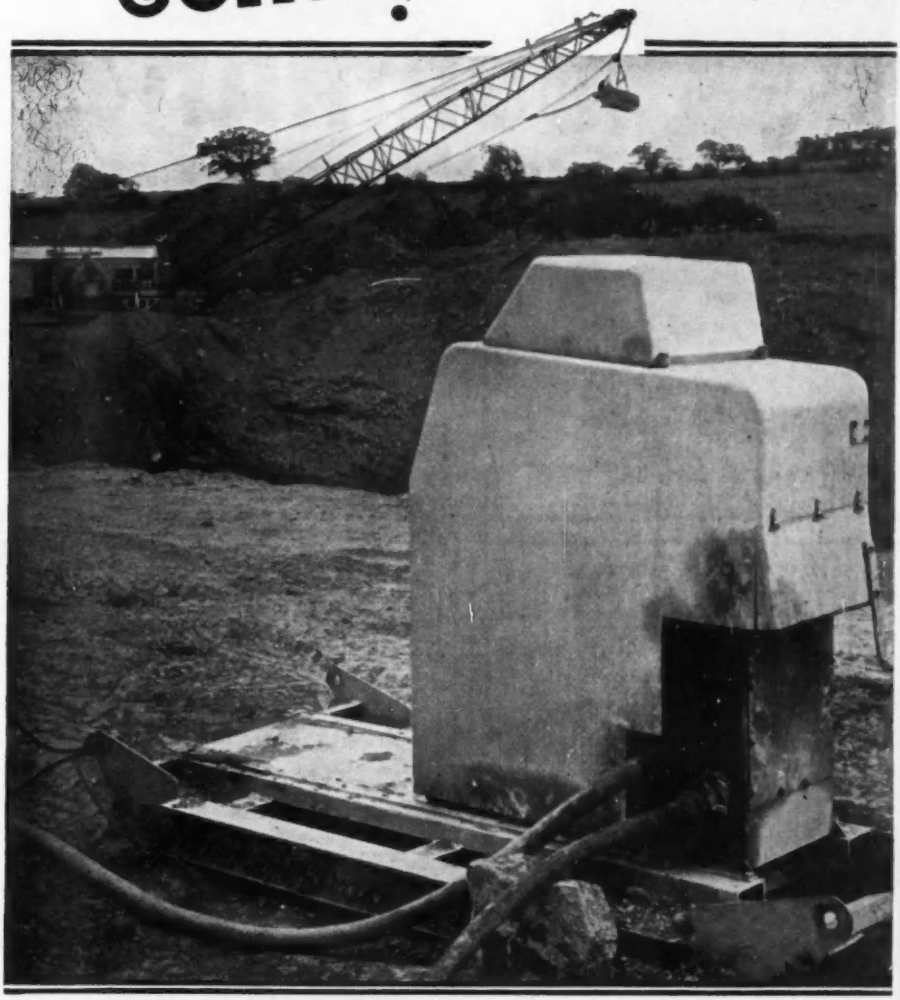

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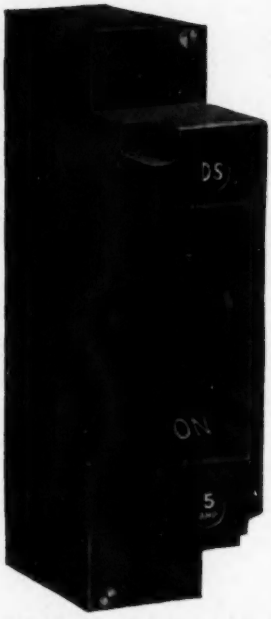

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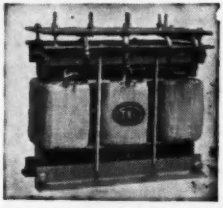

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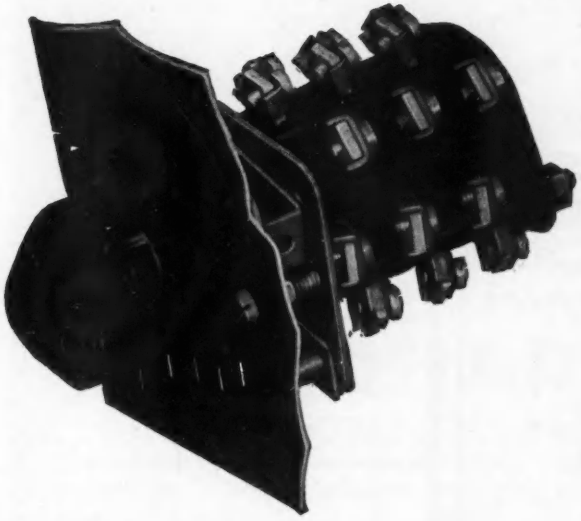

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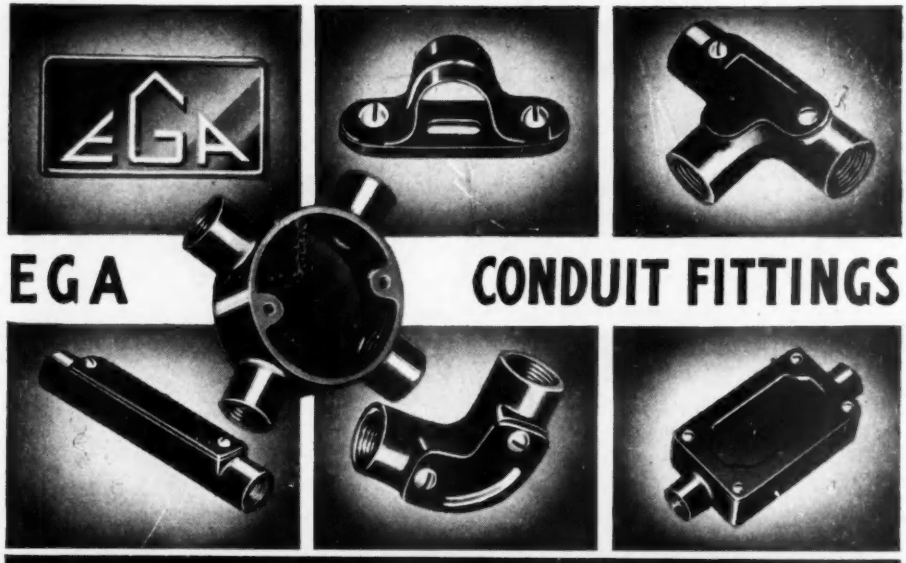

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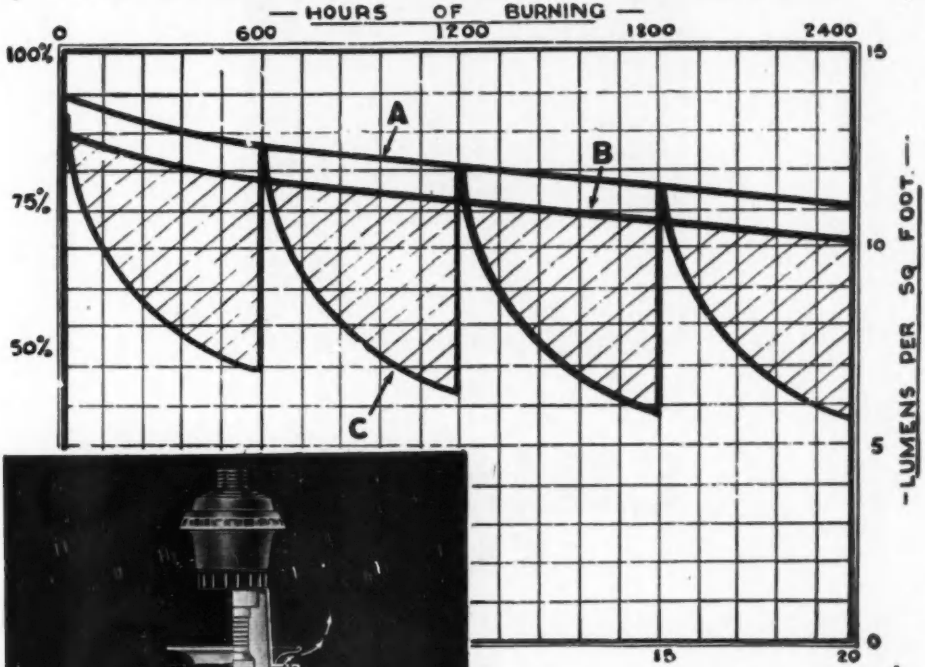

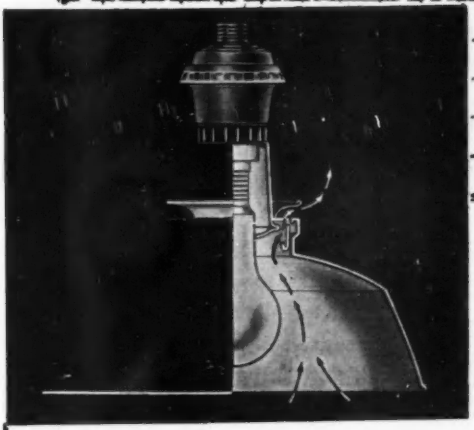

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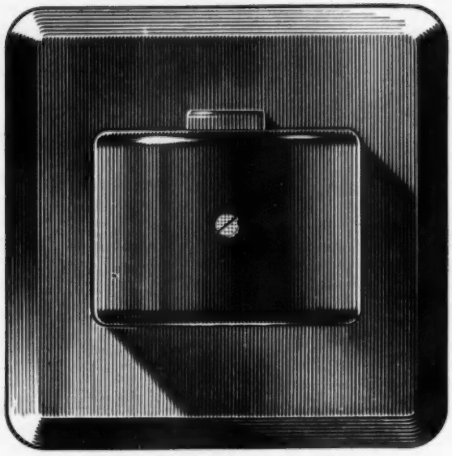

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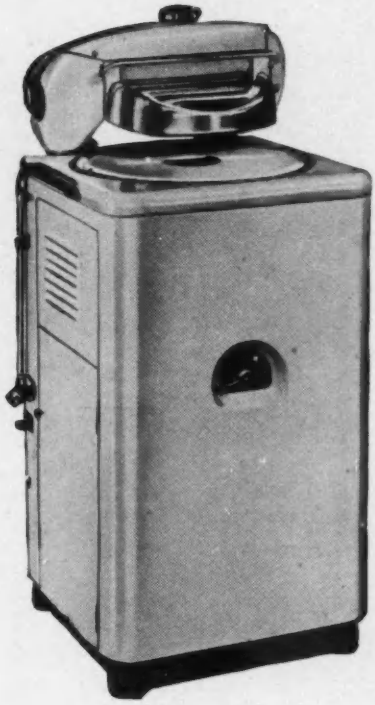

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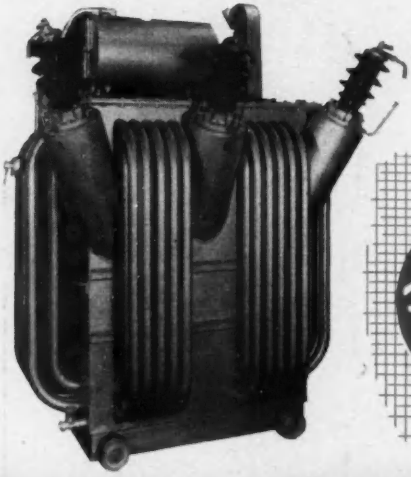

The illustration shows a 400 kVA 22kV transformer for service abroad

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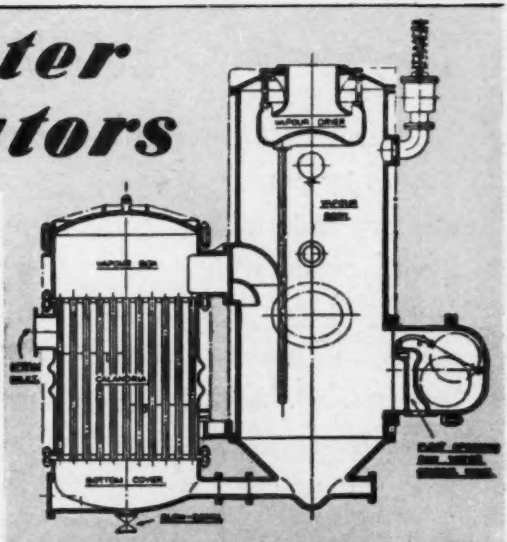

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